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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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76-1853. Karasek, F. W.; Hutzinger, O. (Dep. Chem., Univ. Waterloo, Waterloo, Ontario, Canada). **Environmental chemistry in the Netherlands.** *Anal. Lett.* 9(3): vii-xvii; 1976. (8 references)

In order to understand the impact of chemicals on the environment, studies must be carried out while interactions between the chemicals and the environment are occurring. Such studies provide solutions to existing problems and reveal fundamental environmental factors involved in pollution. A number of environmental science programs have been developed in Dutch universities over the past several years. These programs are reviewed briefly. Government laboratories are also active in this field. Research in environmental chemistry involves the detection and identification of many complex, labile organic compounds. For the usual quantities of such compounds found in the environment, i.e., at the nanogram and picogram level, gas chromatography using high-resolution glass capillary columns offers the best possible results. Instrumental and analytical techniques in the fields of gas chromatography, liquid chromatography, electrophoresis, mass spectrometry, molecular spectrometry, and radiochemistry are being explored. Techniques are being developed which will greatly improve selectivity and increase the detectability of compounds that are almost undetectable with the usual methods.

76-1854. Anonymous. **Are industrial pesticides safe?** *BRE (Building Res. Establishment) News* 35: 4; 1976. (1 reference)

Three projects aimed at assessing the environmental impact of preservative treatments for wood are being conducted: one dealing with the pretreatment of timber with copper-chrome-arsenic (CCA) preservatives, and two dealing with remedial treatments carried out in domestic dwellings. Soil from CCA treating sites may contain very high concentrations of the metals used, and plant growth rate can be considerably retarded in such soil. The risk of pollution of ground water is also being studied, as is the possible release of arsenic into the atmosphere during the burning of treated timber. A substantial proportion of the arsenic appears to be volatilized during burning. The second project involves assessment of the normal operating procedures and practices of remedial treatment companies; the conditions in houses after treatment are also being monitored. Related to this work is a project to assess possible replacements for chlorinated hydrocarbon insecticides for use against wood-boring insects in buildings. A fourth project is concerned with the current uses of chlorinated phenols as general industrial biocides. Possible environmental risks associated with their use will be determined and recommendations will be made.

76-1855. Anonymous. **Studies could yield natural pesticides.** *Chem. Eng. News* 54(18): 21; 1976. (1 reference)

An entirely new class of natural pesticides could be developed based on recent discoveries revealing that plant pathogens contain general molecular "triggers" that stimulate plants to produce toxins (phytoalexins) that stop the growth of the invading pathogens. The triggers (elicitors) from fungi are polysaccharide components of the fungal mycelial walls and are of a very general nature. Quantities of elicitor as small as 1.0 p*M* are able to evoke a plant response. Although a ready, inexpensive, potentially commercial source of elicitors appears to be available in brewer's yeast, ways of introducing elicitors into plants must be discovered. The elicitor extracted from *Phytophthora megasperma* is a β-glucan with a molecular weight of about 100,000. Treatment of this material with an exo-β-1,3-glucanase removes 90% of the β-glucan, leaving a biologically active residual substance with a molecular weight of about 10,000. This residue contains about 4% mannose and is a highly branched 3- and 3,6-linked glucan.

76-1856. Nakamura, H. (Pestic. Testing Lab., Min. Agric. For., Tokyo, Japan). **[Research activities of pesticide residue analysis in prefectural experiment stations.]** *Nippon Noyaku Gakkaishi* 1(1): 65-69; 1976. (Japanese)

In 1969, a program was sponsored by the Ministry of Agriculture and Forestry to aid in the analysis of pesticides by individual prefectural experiment stations. The progress of study and training meetings for pesticide analysts is reviewed. Government financial aid and establishment of study and training meetings at all prefectural experiment stations was begun in 1969 and 1970. Thirty-six people from 28 prefectures participated in the first meeting in 1969 which was devoted to laboratory training in various methods of pesticide analysis. As the number of trained personnel at each station has increased, the meetings of the last few years have been conferences where progress has been reported and opinions and information exchanged.

76-1857. Khan, M. A.; Rao, R. M.; Novak, A. F. (Dep. Food Sci., Louisiana State Univ., Baton Rouge, LA). **Polychlorinated biphenyls (PCBs) in food.** *Crit. Rev. Food Sci. Nutr.* 7(2): 103-145; 1976. (85 references)

This review of PCBs in food concentrates on three general areas: the ubiquitous and potentially hazardous presence of PCBs in the environment, the industrially indispensable nature of PCBs, and the potential toxicity of PCBs in foods. Specific areas covered in the review include: entry, accumulation, and levels of PCBs in the environment; physicochemical properties of PCBs; nomenclature of PCBs; methodological difficulties of analysis; industrial applications of PCBs; presence of PCBs in foods; migration of PCBs from food packaging materials; dietary sources of PCBs; toxicological metabolism and photochemical breakdown; PCBs and the FDA; and the effects of food processing on PCBs.

76-1858. Jancarik, V.; Samek, V. (VULHM, Zbrazlav-Strnady, Czechoslovakia). **Pesticidy v lesnim hospodarstvi**

a hygiena zivotniho prostredi. [Pesticides in forestry and environmental hygiene.] *Lesn. Pr.* 493(10-11): 459-461; 1976. (Czech)

The increasing use of synthetic organic pesticides that began in the forties has brought about not only increases in plant protection, but also increased dangers to the environment. Their use in forests constitutes only a fraction of the total application but, considering these sites as water reservoirs and areas of recreation, there is a great responsibility to society in this connection. Because of the need for increased wood production, the use of pesticides may also have to increase until alternative means of forest preservation are developed. Before rates of application per hectare can be reduced, all possible measures must be taken to protect the environment.

76-1859. Pao, K. C. H. (Insecticide Residue Res. Group, Inst. Tea Res., China). **[Residue studies of phoxim (baythion) on tea bushes.]** *K'un Ch'ung Hsueh Pao* 18(2): 133-140; 1975. (7 references) (Chinese)

A 50% Phoxim (baythion) solution was sprayed on green tea bushes at a dilution of 1:800 and the bushes were exposed to natural sunlight and artificially shaded field conditions. Residual pesticide on fresh tea shoots was determined at various intervals using thin-layer chromatography. The results demonstrated that Phoxim is highly photosensitive, about 99% of the pesticide being photodegraded after 4 hr irradiation under UV light. Phoxim was more photosensitive than either malathion or ethion. Under natural field conditions, the Phoxim residues on the fresh tea shoots degraded rapidly; the residue levels decreased from an initial value of 50.78 ppm to 6.36 ppm after 4 hr to undetectable levels after 2 days. Degradation under artificial shade conditions proceeded more slowly. The residues on the fresh shoots decreased from 50.78 ppm to 18.57 ppm to 8.85 ppm to 4.61 ppm to 4.12 ppm to 2.14 ppm and to less than 0.50 ppm by 4 hr, 24 hr, 28 hr, 2 days, 3 days, and 4 days, respectively. When using 50% Phoxim at a dilution of 1:800, the waiting period from spraying to plucking should be 3 days under sunny conditions and 5-6 days under cloudy conditions.

76-1860. Takacs, J.; Simonffy, Z.; Jancso, H. E. (Gen. Lab., Vet. Meat Control Service, Budapest, Hungary). **Biological residues in meat and meat products in Hungary in the calendar year 1972.** *Acta Vet. Acad. Sci. Hung.* 24(3): 403-405; 1974. (10 references)

Chlorinated hydrocarbon compounds and organic phosphorus insecticide residues were analyzed by thin-layer and gas chromatography from samples of meat, fatty tissue, kidney, and liver of swine and beef cattle; from semi-preserved ham and shoulder; from winter and delicacy salami; from raw, cold, smoked and dried sausages; and from edible lard. In no case were organic phosphorus insecticides detected in 168 different meats and meat products sampled. The DDT and lindane contents of fatty tissue were ten times and five times as high as the respective values for meat. However, they were much lower than the accepted levels tolerated internationally. BHC levels were about the same for swine and cattle, suggesting that BHC accumulated neither in vegetables nor in the animal body. Chlorinated hydrocarbons did not appear to accumulate in liver tissues; therefore, the analysis of liver has to be carried out only in detection of acute poisoning. The total amount of DDT decreases slowly in meat and meat products and thus its presence must be considered for a long time.

76-1861. Woodard, B. T.; Ferguson, B. B.; Wilson, D. J. (Maternal Child Health/Family Planning, Training Res. Cent., Meharry Med. Coll., Nashville, TN). **DDT levels in milk of rural indigent blacks.** *Am. J. Dis. Child.* 130(4): 400-403; 1976. (34 references)

Human milk samples from low-income blacks residing in rural Mississippi and Arkansas and middle-class whites residing in metropolitan Nashville, Tennessee were analyzed for DDT and its metabolites using electron capture gas chromatography. The mean total DDT concentration of 38 samples from the rural blacks was 447 ppb, with a range of 59 to 1,900 ppb. The mean of the 14 samples from the Nashville residents was 75 ppb, with a range of 15 to 133 ppb. In all probability, the difference between the two means can be ascribed to the greater pesticide exposure of the blacks. Due to the limited amount of information from the donors, no correlation was made between the DDT concentration in the milk and the diet, age of child, home pesticide use, or distance of residence from farming fields.

76-1862. Hamelle, G.; Bressolle, F.; Mattras, H. (Lab. Chim. Anal. Toxicol., Fac. Pharm. de Montpellier, Montpellier, France). **Influence des traitements a l'arseniate de plomb sur la teneur en arsenic des pommes. {Effects of lead arsenate treatment on arsenic content in apples.{** *Ann. Fals. Exp. Chim.* 69(738): 197-207; 1976. (French)

Superficial arsenic, collected by washing apples in distilled water, and arsenic content were determined in washed, unpeeled apples. In most cases it was possible to detect treatment with lead arsenate via the concentration of superficial arsenic. Although insoluble, lead arsenate did penetrate somewhat into the flesh of the fruit. Arsenic concentration ranged from 0.096 to 2.93 mg/kg of dry matter. In 43% of cases, the concentrations exceeded the 1 mg/kg limit established by the Societe des Experts-Chimistes de France. In untreated apples, arsenic content was lower than 0.01 mg/kg of apples or 0.08 mg/kg of dry matter.

76-1863. Illes, S.; Mestres, R.; Tourte, J.; Campo, M.; Illes, A. (Lab. Chim. Appl. Exp., Fac. Pharm., Montpellier, France). **Controle des residus de pesticides dans les plantes aromatiques et medicinales. {Determination of pesticide residues in aromatic and medicinal plants.{** *Ann. Fals. Exp. Chim.* 69(738): 209-218; 1976. (4 references) (French)

A method is described for the extraction and gas-chromatographic determination of pesticide residues in aromatic and medicinal plants, and results are presented of pesticide analysis in 42 samples from Algeria, Belgium, Egypt, Spain, Central Europe, France, Lebanon, Morocco, Turkey, and Yugoslavia. The samples were those of alburnum, basil, heather, fennel, juniper berries, anise, basil, bay leaves, lavender, mallow, yarrow, orange peel, marjoram, rosemary, savory, sage, thyme, serpolet, lime blossom, rose, and verbena. The average BHC content was 0.0001 mg/kg, and 2.38% of all samples were contaminated. The corresponding figures are 0.036 mg/kg and 100% for α-BHC, 0.028 mg/kg and 92.85% for lindane, 0.002 mg/kg and 4.76% for aldrin, 0.028 mg/kg and 40.47% for o,p'-DDE + p,p'-DDE, 0.008 mg/kg and 19% for DDD, 0.178 mg/kg and 76.19% for

o,p'-DDT + *p,p'*-DDT, 0.004 mg/kg and 4.76% for dieldrin, 0.017 mg/kg and 2.38% for diethion, 0.014 mg/kg and 2.38% for phosalone, 0.033 mg/kg and 2.38% for methidathion, and 0.133 mg/kg and 4.76% for sulfur.

76-1864. Derache, R. (Lab. Physiol. U.E.R., Centre Etude Amenagement Resour. Natur., Toulouse, France). **Analyse de pesticides dans des conserves de fruits et legumes. [Pesticide analysis in canned fruits and vegetables.]** *Ann. Hyg. Lang. Fr. Med. Nutr.* 11(1): 37-40; 1975. (French)

Pesticide residues were determined in over 10 varieties of canned fruits and vegetables. On the whole, the products were only slightly contaminated and always within official limits. Lindane, aldrin, and dieldrin residues in carrots have considerably decreased within the past 4-5 years. High concentrations of DDT were found in a few apple sauces and tomato pastes, but it is thought that they were probably only accidents. Organophosphate (azinphosmethyl, parathion) residues suggested that canning significantly reduces the concentrations of both compounds; residues were definitely inferior to those found in fresh products. Contrary to the expectation of finding no dithiocarbamate residues, these were detected in fairly significant, though not excessive amounts. The presence of carbon disulfide was either produced by the vegetable or by the dithiocarbamate.

76-1865. Kuthan, A. (Inst. Anim. Husbandry, Bratislava, Czechoslovakia). **Residua DDT, DDE, lindanu a dieldrinu v krmivech dovasenych do CSSR v r. 1973. [Residues of DDT, DDE, lindane, and dieldrin in fodder imported to Czechoslovakia in 1973.]** *Biol. Chem. Vyz. Zvirat* 9(4): 6; 1973. (Czech)

Thirty-eight samples of imported fodder were analyzed. The lowest amount of residue to be considered was set at 0.4 mg per 1 kg of fodder. The residues were found in nine of the samples. Six samples of wheat were found to be contaminated—four by DDT or its metabolite DDE and two by lindane. Residues of lindane were also found in two samples of bran from Iraq. Dieldrin was found in one sample of shredded cotton from India. The greatest permissible amount of lindane in cereals in Czechoslovakia is 10 mg per 1 kg. At this time there are no set standards for residues of DDT in the cereals; abroad they are around 1 mg per 1 kg. Standard for dieldrin in other countries is 0.02 mg per 1 kg. This means that the sample of Indian shredded cotton was highly contaminated with the amount of dieldrin at 0.4 mg per 1 kg.

76-1866. Hertwig, K.; Leiderman, L.; Lobato dos Santos, C. A.; Grassi, N. (Herbicides Sect., Nat. Res. Cent., Sao Paulo, Brazil). **Dissipacao dos herbicidas no solo. [Dissipation of herbicides in the soil.]** *Biologico* 40(1): 11-21; 1974. (12 references) (Portuguese)

The dissipation of herbicides in the soil is reviewed in terms of the following mechanisms: volatilization, photodecomposition, chemical decomposition, microbial decomposition, percolation, evaporation-transpiration, colloidal adsorption, and absorption by plants. The penetration and dissipation of herbicides are determining factors in the duration of their activity; the influence of soil type, the danger to a crop subsequently planted on the same soil, and the correct mode of application of the herbicide must be considered. The esters of 2,4-D vary greatly in volatility, the isopropyl ester being 20,000 times as volatile as the herbicide monuron at 25°C. Amides, anilides, carbamates, dithiocarbamates, thiocarbamates, phenols, phenyl esters, amines, and heterocyclic compounds of the herbicides can be completely decomposed by solar ultraviolet rays under the proper conditions. Herbicides can be oxidized, reduced, hydrolyzed, or hydrated apart from biological influences. Prometone forms isomers and undergoes dismutation when heated to 260°C. Most herbicides are subject to direct attack by algae, actinomycetes, bacteria, and fungi. Due to colloidal adsorption, soils with a high content of organic material will require larger applications of herbicides before crop damage appears; argillaceous soils require heavier applications than sandy soils. Herbicides can have teratogenic effects on plants that they do not kill outright.

76-1867. Ribas, C.; Pigati, P.; De Almeida, P. R. (Residues Dep., Inst. Biol., Sao Paulo, Brazil). **Residuos de dieldrin e endosulfan em graos de cafe. [Dieldrin and endosulfan residues in coffee beans.]** *Biologico* 40(4): 120-122; 1974. (11 references) (Portuguese)

The presence of residues from two pesticides, dieldrin and endosulfan, used in the fight against the coffeeborer, was investigated in processed but unroasted coffee beans, grown in experimental fields. The coffee plants were sprayed with a 2% oil solution of dieldrin or endosulfan in two applications (30 ml/plant, 130 and 100 days before the harvest), or in a single application (30 ml/plant, 130 days before the harvest). The beans were then processed by removal of the pulp and starch, and by drying in the shade. The analyses were carried out during the following year (no other details) and concluded approx. 2 yr. after the harvest. The pesticides are extracted with a 65:35 acetonitrile-water mixture and purified through a column packed with Florisil. The determinations were made by gas chromatography using a GC-4 Beckman apparatus equipped with tritium electron capture detector and glass column with 3% SE-30. The results showed no residues of dieldrin or endosulfan in the samples. All determinations were carried out in duplicate and the sensitivity of the method was approx. 0.01 ppm.

76-1868. Almeida, W. F. (Animal Biol. Div., Biol. Inst., Sao Paulo, Brazil). **Acumulo de inseticidas no homem e sua significacao epidemiologica. [Accumulation of insecticides in humans and its epidemiological significance.]** *Biologico* 40(6): 171-183; 1974. (78 references) (Portuguese)

Accumulation of organochlorine pesticides in the fatty tissues of humans has been reported: 1.75 (Nether-

lands) - 31.0 (India) ppm total DDT;1.15 (France) - 2.43 (Argentina) ppm heptachlor epoxide. Higher levels of organochlorines were found in 25-44 yr. old subjects, while low levels of DDT were encountered in persons with meatless diets and in Eskimos, whose diet is devoid of DDT. Very high DDT levels (647 ppm) were found in a person working at the formulation of DDT and in volunteers (657 ppm) after ingestion of *p,p'*-DDT (35 mg/d x 21 mo.). The level of organochlorine accumulation in the blood of humans is reported for 4 countries. The highest total DDT (336 ppb) was found in Rio de Janeiro (Brazil). Effects of organochlorines on enzyme systems of some mammals and a relationship between DDT dosage and the onset of hepatic tumors in rodents are known. The carcinogenic effects in rodents cannot be extrapolated to humans. Severe poisonings were seen in humans exposed to 16-28 mg/kg/d doses of DDT, and moderate poisoning with 10 mg/kg/d; doses of 0.5 and 0.25 mg/kg/d were tolerated by exposed workers for 6.5 and 11-19 yr respectively. DDT was effective in the treatment of patients with nonhemolytic icterus and *o,p'*-DDD has been administered to patients with Cushing's syndrome and adrenal carcinoma.

76-1869. Richou-Bac, L.; Mollet, M. F.; Restuit, A.; Pantaleon, J. (Lab. Cent. Hyg. Aliment., Paris, France). **Donnees recentes sur la contamination des produits laitiers francais par les composes organo-chlores. [Recent data on contamination of French dairy products by organochlorine compounds.]** *Bull. Acad. Vet. Fr.* 47(8-9): 379-390; 1974. (4 references) (French)

Organochlorine compound residues were determined in cheese and butter samples from 1972-1974. Results indicate that total BHC isomer contamination has been decreasing since 1972: 0.215, 0.215, 0.120 (median value in ppm); only lindane has remained more or less constant with only a slight decrease: 0.060, 0.060, 0.044. HCB was always found, like lindane, at fairly low concentrations; 0.044, 0.044, 0.024. Cyclodienes, dieldrin, and heptachlor epoxide, which had slightly increased in 1971, also generally decreased: 0.058, 0.058, 0.029, and 0.025, 0.039. DDT and its metabolites, always in trace amounts, were rarely detectable; toxaphene was never found. PCBs were equally undetectable in the samples. The ratio of daily average consumption to daily maxium acceptable dose has generally significantly decreased: from 0.60 in 1971 to 0.18 for dieldrin, from 0.13 to 0.05 for heptachlor epoxide, from 0.002 to 0.003 for lindane, and presently 0.025 for HCB.

76-1870. Wassermann, M.; Nogueira, D. P.; Tomatis, L.; Mirra, A. P.; Shibata, H.; Arie, G.; Cucos, S.; Wassermann, D. (Dep. Occup. Health, Hebrew Univ., Hadassah Med. Sch., Jerusalem, Israel). **Organochlorine compounds in neoplastic and adjacent apparently normal breast tissue.** *Bull. Environ. Contam. Toxicol.* 15(4): 478-484; 1976. (10 references)

Malignant tissue and adjacent, apparently normal, glandular and adipose tissue from nine women with adenocarcinoma of the breast and mammary gland and adjacent adipose tissue from five healthy accident victims were analyzed for organochlorine compounds using electron capture gas chromatography. In the normal tissues, the *p,p'*-DDE content was greater than that of *p,p'*-DDT, whereas the reverse was true in the neoplastic tissue. *o,p'*-DDT was greatly increased in the malignant tissue compared with the normal tissue, and *o,p'*-DDD was also fairly high compared with control values. The concentrations of total DDT and PCBs in the cancer patients were higher in the malignant tissue than in the adjacent mammary and adipose tissues. The values obtained in the normal tissues from the cancer patients were similar to those in the tissues from the healthy control subjects. The concentration of individual chlorinated biphenyls was also highest in the extracted lipids of malignant tissue. The results suggest different rates of metabolism of the organochlorine compounds in the malignant and normal tissues.

76-1871. Archer, T. E. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Removal of parathion and related products from lettuce trim.** *Bull. Environ. Contam. Toxicol.* 15(4): 488-496; 1976. (5 references)

Seven days before harvest, Climax lettuce heads were sprayed with parathion 4 E.C. at 1/2 and 1 lb a.i./acre. At harvest, the trim leaves were separated from the edible head, chopped, mixed, and subjected to various pesticide removal procedures. Prior to pesticide removal treatment, the three major compounds detected in all samples by gas chromatography were parathion, aminoparathion, and *p*-nitrophenol. Based on removal of the parathion residues, washing with water only removed about 29% of the contaminants, while 95% ethanol removed 66%, 95% ethanol in 1 *N* HCl removed 70%, and 95% ethanol in 1 *N* NaOH removed 97%. At 55°C, these same wash solutions removed 42%, 81%, 90%, and 99% of the parathion contaminant, and at 75°C, they removed 50%, 87%, 93%, and 99% of the contaminant, respectively. Aminoparathion appeared to be more stable to alkali treatment than parathion, and parathion appeared to be more stable to acid treatment than aminoparathion. The treatments that produced the best removal of the parathion contaminant from the lettuce trim with the least amount of damage to the plant material were aqueous 0.1 *N* $NaHCO_3$ at 75°C, 95% ethanol at 55 and 75°C, and 95% ethanol and 1 *N* HCl at 55 and 75°C.

76-1872. Jeng, S. S.; Sun, L. T. (Inst. Zool., Acad. Sinica, Taipei, Taiwan 115, Republic of China). **Organochlorine pesticide residues in cultured fishes of Taiwan.** *Bull. Inst. Zool. Acad. Sin.* 13(1): 37-45; 1974. (14 references)

This is the first report on pesticide residues in some important fishes cultured on Taiwan and in oysters and

clams reared along the coast. From September 1972 to September 1973, 167 fishes of 5 species, 631 oysters, and 20 clams were analyzed for pesticide residues. To the limits of the gas chromatographic method employed, no aldrin, endrin, heptachlor, or heptachlor epoxide were detected in any of the fish or shellfish examined. Small residues of BHC compounds were noted in almost all the fish and shellfish with maximum values not exceeding 0.16 ppm in fish muscle or viscera. Small amounts of DDT were present in the edible portions of the fish and oysters with values less than 0.15 ppm. No DDT nor any DDT metabolites were detected in clams. Fish contained less than 0.05 ppm dieldrin. The results of this study indicate that the use of organochlorine pesticides over the past 20 years has not resulted in significant accumulations of these pesticides in fishes and shellfishes as to render them unsuitable for human consumption.

76-1873. Cochrane, W. P.; Greenhalgh, R.; Looney, N. E. (Lab. Serv. Sect., Plant Prod. Div., Agric. Canada, Ottawa, Ontario, Canada). **Residues in apples sprayed with fenoprop.** *Can. J. Plant Sci.* 56(1): 207-210; 1976. (4 references)

A 20 ppm solution of fenoprop was applied to the drip-point to McIntosh apple trees using a hand gun. Declination was studied in an "early" harvest and a 'late' or normal harvest series. Samples taken 2 hr and 1-10 days after spraying were analyzed by electron capture gas chromatography. Initial residues never exceeded 0.115 ppm, and in only three instances were higher residues subsequently recorded—at 2 days (0.121 ppm), 3 days (0.118 ppm), and 5 days (0.119 ppm)—all in the early series. Generally, the proportion of fenoprop that conjugated with the apple accounted for only 10-20% of the total residue. In both series, the level of fenoprop residue decreased slowly from spraying to the time of harvest (10 days). A 50-80% reduction in residue levels was achieved by washing and and waxing, whereas no declination in residues was observed after up to 4 mo storage.

76-1874. Uhnak, J.; Szokolay, A.; Sackmauerova, M. (Nat. Inst. Hyg., Bratislava, Czechoslovakia). **Porovnanie zatazenia obyvatel'stva reziduami chlorovanych insecticidov z mliecneho tuku a celodennej stravy. [A comparison of the population exposure to residues of chlorinated insecticides from milk fat and daily diet.]** *Cesk. Hyg.* 19(6-7): 280-285; 1974. (19 references) (Slovak)

Chlorinated insecticide residues were monitored for several years in milk products and in human daily diet. Average residue content in milk fat (mg/kg) was as follows: γ-BHC, 0.041; α + β + δ-BHC, 0.084; *p,p'*-DDT, 0.059; *p,p'*-DDE, 0.082. Average daily human consumption was calculated to be 0.0042 mg of BHC and 0.0037 mg of DDT. Average daily intakes observed in students in Slovakia were found to be fifteen times lower (BHC) and three times lower (DDT) than standards established as acceptable by the World Health Organization.

76-1875. Watkins, D. A. M. (Long Ashton Res. Station, Univ. Bristol, Bristol, England). **Photolysis of thiabendazole.** *Chemosphere* 5(2): 77-78; 1976. (3 references)

A solution of thiabendazole in methanol was irradiated with a medium pressure Hanovia lamp (100 w) in a borosilicate glass apparatus. After 9 days, the peak at 302 nm had almost disappeared, and the pale yellow solution was concentrated in a rotary evaporator at 40°C to give a residual oil with a pH of 2.9 in aqueous solution. An aqueous solution of the residual oil was rotary evaporated at 40°C and treated with ammonia. Vacuum evaporation of this solution left a white solid identified as ammonium formate. The oil remained after removal of the precipitate. The filtrate was absorbed on alumina, added to an alumina column packed in light petroleum, and eluted with ether containing methanol to yield a fraction containing thiabendazole. Increasing the methanol content gave an initial fraction which yielded thiazole-4-carboxamide. The next fraction contained benzimidazole-2-carboxamide, elution of which with 25% methanol in ether yielded benzimidazole. Elution using pure methanol yielded thiazol-4-ylamidine and methyl thiazole-4-carboxylate. Further elution with increasing proportions of water in the methanol and 1% aqueous acetic acid yielded several unidentified fractions.

76-1876. Mueller, W.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen- Umweltforsch. mbH, D-8000 Munich, Germany). **Beitraege zur oekologischen Chemie CXVII. Polychlorierte Biphenyle und Hexachlorbenzol in Umweltproben aus dem Sueddeutschen Raum. [Contributions to environmental chemistry, Part 117. Polychlorinated biphenyls and hexachlorobenzene in environmental samples from Southern Germany.]** *Chemosphere* 5(2): 95-100; 1976. (8 references) (German)

Samples of uncultivated plants, eggs of rapacious birds and chickens, chicken meat and chicken feed, all taken from the southern part of West Germany, were analyzed for residues of PCBs, BHC, and other pesticides by gas chromatography. Plant samples from sites near inhabited areas contained 0.09-0.57 mg of PCB per kg, against 0.05-0.15 mg/kg in Alpine regions. The contamination with PCBs in the Alps must be due to atmospheric transport. The *p,p'*-DDT residues in plants were below 0.3 mg/kg. Eggs of rapacious birds contained 7-286 mg of PCB, 3.3-116 mg of DDE, and 0.2-19 mg of BHC per kg. BHC residue levels of 0.44-0.59 mg/kg in the fat and 0.32 mg/kg in the liver were found in a chicken fed with a feed containing 0.1 mg of BHC per kg for 18 months.

76-1877. Eder, G. (Inst. Meeresforsch., Bremerhaven, Germany). **Polychlorinated biphenyls and compounds of the DDT group in sediments of the central North Sea and the Norwegian depression.** *Chemosphere* 5(2): 101-106; 1976. (8 references)

The vertical distributions of chlorinated hydrocarbons within the upper 20 cm of North Sea sediments were

studied at sites not directly affected by river outfalls or dumping. Analysis was by gas-liquid chromatography with helium-glow electron capture detection. The average PCB concentrations varied from 14.0 to 28.0 ppb (μg/kg dry sediment) in the upper 10 cm and from 10.5 to 40.5 ppb in samples taken from below 10 cm. The average DDE, DDD, and DDT concentrations in the upper 10 cm were 0.12-0.27, 0.074-0.45, and 0.30-0.44 ppb, respectively, while the average levels in the deeper samples were 0.064-0.29, 0.02-0.26, and 0.15-0.36 ppb, respectively. Most of the DDD and DDT values were not statistically significant, and in most cases, the residue levels showed a significant decrease with increasing core depth. Two of the sampling sites seem sufficiently remote from any presumptive sources of direct pollution to regard the residue concentrations at these sites as background values, but more extended investigations are required.

76-1878. Kumarasamy, R.; Raghu, K. (Biol. Agric. Div., Bhabha Atomic Res. Cent., Bombay, India). **Copper dimethyldithiocarbamate, a degradation product of thiram in soil.** *Chemosphere* 5(2): 107-112; 1976. (11 references)

One mg of thiram was added to 20 g of soil and incubated at 26°C for 24 hr. The soil was extracted, dried, and concentrated, and the visible and UV absorption spectra were taken. An aliquot of the extract was spotted on silica gel thin layer with the standard 1:2 complex of copper dimethyldithiocarbamate ($CuDDC_2$). In additional experiments, radioactive copper sulfate solution was added with thiram to soil and the procedure was repeated. The CCl_4 extract of thiram-treated soil and the TLC spot corresponding to an *R*f value of 0.75 showed absorption spectra similar to standard $CuDDC_2$. The *R*f value of the standard was also 0.75, and the copper content in different regions of the developed TLC plates showed that the compound corresponding to *R*f 0.75 had a higher copper content than spots in other regions. The experiments with labeled copper sulfate solution showed the formation of ^{64}copper dimethyldithiocarbamate when thiram and $CuSO_4$were allowed to react. Autoradiography of the chloroform extract of the treated soil in TLC showed a single prominent spot corresponding to standard $CuDDC_2$. The compound corresponding to $CuDDC_2$ showed inhibition zones when TLC plates were sprayed with spores of *Glomerella cingulata*. The prolonged fungicidal activity offered by thiram may at least in part be due to the presence of $CuDDC_2$.

76-1879. Rajukkannu, K.; Raguraj, R.; Muthuswamy, P.; Krishnamoorthy, K. K. (Dep. Soil. Sci. Agric. Chem., Tamil Nadu Agric. Univ., Coimbatore, India). **Residues of certain systemic insecticides in sweet potato tubers.** *Current Sci.* 45(1): 35; 1976. (4 references)

Soil applications of Temik (aldicarb), carbofuran, and disyston (disulfoton) granules (1.00 kg a.i./ha) were used to control sweet potato weevil (*cylas formicarius*); the insecticides were applied at the time of tuber formation. Fresh tuber samples collected at harvest time were analyzed for insecticide residues. The residue levels were as follows: temik, 0.095 ppm; carbofuran, 0.015 ppm; and disyston, 0.326 ppm. All residues were well below the USA FDA tolerance limits, indicating that these systemics can be applied to the soil at 1.0 kg/ha to control the sweet potato weevil.

76-1880. Berezovskiy, M. Ya. (Author address not given). **Ob ostatochnykh kolichestvakh nekotorykh gerbitsidov v rasteniyakh i pochve. [Residues of certain herbicides in plants and in soil.]** *Dokl. Vses. Akad. Sel'sk. Nauk* 6: 16-18; 1974. (11 references) (Russian)

The degradation and residue dynamics of picloram and dicamba in soil and plants were studied by thin-layer chromatographic analyses and by means of indicator plants grown in soil contaminated with these herbicides. Judging from the growth inhibition observed in bean as test plants, picloram persisted in soil in considerable amounts for 3 years after application in doses of 0.25-3 kg/ha. Complete degradation of dicamba was observed in the soil in 6 months after the application of 15-20 kg/ha doses, and the growth-inhibiting effect, observed during the next 2 years, is attributed to the accumulation of a metabolite, 3,6-dichlorosalicylic acid, which accounted for 9.9% of the total input at 6 months.

76-1881. Stewart, D. K. R. (Canada Agric., Res. Stn., Kentsville, Nova Scotia, Canada). **Chlordane uptake from soil by root crops.** *Environ. Entomol.* 4(2): 254-256; 1975. (14 references)

A study was made of the residues of chlordane in crops and soils to determine possible changes in the relative amounts of the chlordane components. Chlordane was applied into a sandy loam soil (12% clay) at a rate of 6 lb AI/acre. Residues were noted in beets, carrots, parsnips, and rutabagas of 0.03, 0.26, 0.24, 0.04, and 0.01 ppm, respectively. When these same crops were grown in a sandy loam soil (28% clay), the residues were 0.01, 0.07, 0.12, 0.15, and 0.01 ppm chlordane, respectively. The qualitative composition of the soil and crop residues did not change greatly during the 16 month period after chlordane application.

76-1882. George, D. A.; Maitlen, J. C.; Powell, D. M.; McDonough, L. M. (Yakima Agr. Res. Lab., Agric., Res. Serv., USDA, Yakima, WA 98902). **Aldicarb residues in potatoes.** *Environ. Entomol.* 4(4): 642-644; 1975. (6 references)

The efficacy of aldicarb for control of green peach aphids, *Myzus persicae* on the Russet Burbank variety of potatoes was studied. Residues and degradation products of aldicarb before and after harvest, and its distribution within the potato were also studied. A 10% granular formulation was applied at 0.453, 0.907, and 1.360 kg active ingredient/acre to soil in which potatoes were grown. Re-

sidues in potatoes ranged from 0.20 to 0.04 ppm at harvest. When two 3-lb treatments were applied, residues ranged from 0.38 to 0.06 at harvest. The peeled potato and the peel of the potato were analyzed. The residue at the 95% probability level had a small but significantly higher residue in the peel. The residue was not destroyed by baking the potato. At one of the test areas the high rate of aldicarb reduced aphid population and delayed transmission of the virus, which reduced the percentage net necrosis in the tubers to within the allowable 5% internal discoloration. The lower rates of application were ineffective. At the other 3 testing sites neither the aphid population nor the amount of virus was great enough to show differences between treatment levels.

76-1883. Laveglia, J.; Dahm, P. A. (Dep. Entomol., Iowa State Univ., Ames, IA 50011). **Oxidation of terbufos (Counter) in three Iowa surface soils.** *Environ. Entomol.* 4(5): 715-718; 1975. (14 references)

A study was made of the oxidation of terbufos in 3 Iowa soils. Terbufos is a new soil insecticide which may be used extensively in the future. The insecticide was applied to 10-g samples of the soils at a rate of 1 ppm. This is equivalent to a field application rate of 1 lb/acre. Soil samples were then incubated at 22°C for 0, 1, 3, 7, 14, and 21 days. The results of this study showed that the chemical was rapidly oxidized to its sulfoxide. The parent compound had an approximate half-life of 4 to 5 days. Terbufos sulfoxide reached maximum concentration at 2 weeks of incubation. The sulfone did not appear until 1 week after incubation started. The soils showed significant differences in their abilities to oxidize the chemical. The sulfoxide and sulfone had no inhibitory influence on soil microbial activity. It is concluded that, under the conditions of these soil tests, terbufos is rapidly oxidized to terbufos sulfoxide. By the end of the third week, terbufos is practically absent from the soil.

76-1884. Parmar, B. S.; Pandey, S. Y.; Mukerjee, S. K. (Div. Agric. Chem., Indian Agric. Res. Inst., New Delhi-110012, India). **Photodegradable formulations of DDT.** *Experientia* 32(3): 279-280; 1976. (7 references)

A study was made of the ability of various photosensitizers to speed the degradation of DDT when incorporated into the commercial DDT formulations, and their effect was observed on the physicochemical characteristics of such compounds. The test sensitizers were diphenylamine and diethylaniline. The ratio of DDT to sensitizer in the formulations was 1:1. The results of the study indicate that both diphenylamine and diethylaniline enhance the photodegradation of DDT. The enhancement is initially more; almost 30-40% more DDT is lost in sensitized compounds compared to DDT in the control. The subsequent slowing down of the rate may be attributed to the volatile nature of these amine sensitizers. The relative efficiency of the sensitizers seems influenced by plant surfaces. An overall better performance was noted with diphenylamine. The incorporation of either sensitizer did not affect the storage stability, pH, sieve requirement, or color of the formulation, nor did it introduce any phytotoxicity. However, the addition of diphenylamine lowered the suspensibility which, although still marginally above the World Health Organization prescribed limit of 60%, may be a slight cause of concern.

76-1885. Bertling, D. (5600 Wuppertal-Barmen, Germany). **Zum Rueckstandsproblem bei der Erzeugung von Lebensmitteln. [Residue problems in connection with food processing.]** *Fleischwirtschaft* 55(4): 500-501; 1975. (German)

General problems are discussed of pesticide residues and other contaminants in foods in West Germany. The ban on DDT can not be expected to have an immediate effect due to the slow degradation of its residues and to the importation of DDT-contaminated food. Lettuce and other fresh vegetables often contain dithiocarbamate residues well above the tolerance level. The compliance with the residue standards requires intensified laboratory control at both production and processing sites.

76-1886. Tolle, A.; Heeschen, W.; Bluethgen, A. (Inst. Hyg., Bundesanst. Milchforsch., 2300 Kiel, Germany). **Biozide und toxische Spurenstoffe in der Nahrungskette Boden—Pflanze—Milch—Mensch. [Biocides and toxic contaminants in the trophic chain: soil, plants, milk, man.]** *Fortschr. Veterinaermed.* 20(10): 197-206; 1974. (12 references) (German)

Results are presented of systematic analyses of milk and milk products for organochlorine pesticides, antibiotics, and heavy metals in West Germany. Analyses of 3,641 samples of pasteurized milk and milk products revealed a reduction of the total DDT residue levels by 71%, of the heptachlor and heptachlor epoxide levels by 66%, and of the aldrin and dieldrin levels by 78% during the 1969-1973 period, while the lindane levels dropped by 38% from the initial value after a temporary rise. The pesticide levels in human milk are up to 8.7 times higher than in cow's milk. The restrictions and bans on the use of certain organochlorine pesticides can be expected to lead to a further reduction of the pesticide levels in milk and in human fatty tissues.

76-1887. Thomason, I. J.; McKenry, M. V. (Exp. Sta., Univ. California, Riverside, CA). **1,3-Dichloropropene and 1,2-dibromoethane compounds. Part I. Movement and fate as affected by various conditions in several soils.** *Hilgardia* 42(11): 393-421; 1974. (34 references)

The movement and fate of 1,3-dichloropropene and 1,2-dibromoethane were predicted in two soils using extrapolations from lab experiments and soil-vapor phase concentrations obtained from simulated field conditions. In soils whose moisture content is nearest the wilting point of plants, the most far-reaching diffusion patterns in min-

eral soils were obtained, 15 bars moisture tension. Increasing the moisture content of the soil limited the diffusion pattern gradually. This limiting effect was most noticeable when fine-textured soils had moisture contents in excess of 1/2 bar moisture tension at the 30.5 cm depth. A faster rate and greater distance of nematicide diffusion was obtained by fumigating warm soils (25°C). In colder soils diffusion was slower, persistence longer, but the total distance of diffusion of the effective dose was decreased. Soil-air space and size of pores are significant factors, as the chemicals move mainly in the vapor phase and the smaller pores are easily blocked when water is present. Fumigant applicators must successfully seal the soil surface and chisel shank hole after an application so as to avoid significant losses to the atmosphere, especially if the subsoil is in a moist to wet condition.

76-1888. Machimura, N. (Fukui Prefect. Agric. Exp. Stn., Fukui, Japan). **[Distribution of organophosphorus pesticide residues in edible herbs.]** *Hokuriku Byogaichu Kenkyukai (Proc. Assoc. Plant Protect. Hokuriku)* 23: 121-127; 1975. (8 references) (Japanese)

Residues of malathion and dimethoate applied to lettuce, cabbage, Chinese cabbage, spinach, and two species of seasoning greens were determined 1, 3, 5, 7, and 14 days after application. The insecticide formulation was 50% EC; the applied liquid was diluted 1000 fold and the dose was 2000 l/10a. The results revealed that the residue in head vegetables was highest in Chinese cabbage, followed by lettuce and cabbage. Among non-head vegetables the residues were highest in spinach, followed by two species of seasoning greens. A negative linear correlation was found between the logarithm of the residual concentration and the number of days after the last application. According to position, the residues were highest in the outermost leaves, followed by the outer leaves of the head and the central edible part of the head. Residues were higher in leaf blades than in petioles. About 80-95% of the residue remained in the outermost leaves and less than 20% of the residue remained in the head center. Residues were not detected, however, in the center of cabbage heads. The half-life of the residues was longest in lettuce, followed by cabbage and Chinese cabbage. Dimethoate oxon was found on all the crops except cabbage at concentrations of 1-20% of the original insecticide concentration deposited. The residue of the metabolite reached a maximum three days after application.

76-1889. Irvine, J.; Dahlgren, S. E. (Rentokil Ltd., East Grinstead, Sussex, England). **The mechanism of leaching of copper-chrome-arsenic preservatives from treated timber in saline waters.** *Holzforschung* 30(2): 44-50; 1976. (32 references)

On the basis of theoretical calculations and experimental studies using timber subjected to a range of water types of different ionic compositions, a mechanism for the leaching of copper-chrome-arsenic preservatives is proposed. The leaching rate is affected by complex formation by copper (II) and chromium (III) with chloride and hydroxide ions. The salt effect on the activity coefficient is of even greater importance. The various complexes formed at different pH values are discussed. Two minima are noted in the plot of copper leaching vs. water salinity. These are attributed to the presence of the copper fixation compounds $Cu_2(OH)AsO_4$ and $Cu_3(AsO_4)_2$. NaCl had a coagulating effect on the copper fixation compounds at low salinities, reducing their solubility. At higher salinities, however, complex formation dominated. The coagulation effect is not noted with chromium and leaching increased with increasing salinity. Loss of arsenic lagged behind that of copper and chromium and was related to the chromium excess in the preservative formula. The greater the excess, the longer the delay in arsenic loss. The suggested mechanism adequately explains the experimental results.

76-1890. Ismail, M. A.; Wardowski, W. F. (Agric. Res. Educ. Cent., Univ. Florida, Lake Alfred, FL). **Removal of sodium *o*-phenylphenate and other phenolic contaminants from packinghouse effluents.** *HortScience* 9(6): 597-598; 1974. (12 references)

Studies were conducted to determine how the load of phenolic constituents in packinghouse effluents might be reduced prior to disposal. Polyclar AT[3], an insoluble form of polyvinylpyrrolidone, was added to 100 ppm sodium *o*-phenylphenate (SOPP) at 5, 6, 7, 8, 8, 10, and 15% (g/100 ml), stirred for 2 min, and aspirated through Whatman no. 42 filter paper. Filtrate was diluted and analyzed for phenolic compounds. The percentage SOPP removal was directly proportional to the concentration of Polyclar from 5 to 15%. Removal efficiency decreased when SOPP solutions exceeding 100 ppm were treated with 10% Polyclar. Powdered activated charcoal was applied to 100 ppm SOPP solution at 10 g/100 ml and was noted to remove 99.95% SOPP from solution. Effluent samples from packinghouse which contained SOPP were treated with either 10% Polyclar or 1% activated carbon and the filtrates analyzed for phenolic-type compounds. Polyclar removed 94 to 95% SOPP while activated carbon removed more than 99% phenolics. Use of *o*-phenols and their salts as fungicides on many foods is essential to prevent postharvest decay. Improper disposal of packinghouse effluents containing high levels of such phenolic compounds can harm the environment.

76-1891. Addison, J. B.; Silk, P. J.; Unger, I. (Dep. Chem., Univ. New Brunswick, Fredericton, New Brunswick, Canada). **The photochemistry of carbamates V. The photodecomposition of sevin (1-naphthyl-*N*-methyl carbamate) and of phenmec (phenyl-*N*-methyl carbamate).** *Intern. J. Environ. Anal. Chem.* 4(2): 135-140; 1975. (12 references)

Data is presented on the phototransformations of sevin (carbaryl), one of the most commonly used

insecticidal carbamates, and of phenmec, which is not known to be pesticidal, but which may be considered structurally as the parent of all the carbamates. The photolysis of sevin was examined in aerated and degassed ethanol, cyclohexane, isopropyl alcohol, and *t*-butanol solutions. Under all conditions alpha-naphthol was the major product and in cyclohexane solution, the only product. In polar solvents in addition to the phenol small amounts of naphthamides and naphthalene were produced. Both alpha and beta cleavage occurred in the photolysis of sevin under the conditions employed in this study. In aerated and degassed ethanol the products from phenmec are phenol, *ortho* and *para* hydroxy benzamides, and small quantities of benzene. Phenmec photolysis in ethanol yielded all three possible photo-Fries products, as there are no ring substituents.

76-1892. Aharonson, N.; Resnick, C. (Pesticides Div., Plant Protection Dep., Tel-Aviv-Yafo, Israel). **Monocrotophos residues in citrus, 1970-71.** *Isr. J. Entomol.* 8: 167-177; 1973. (6 references)

Studies were made of the distribution of monocrotophos within trees, its translocation, and its rate of degradation. Plots of orange trees and lemon trees were sprayed with 0.08% or 0.16% monocrotophos. Three months later other trees were similarly sprayed. The insecticide was sprayed at a rate of 160 liter/ha. Monocrotophos residues were identified by gas chromatography and cholinesterase inhibition methods. Limits of detection for the analyses were 0.2 ppm for the leaves and 0.05 ppm for the fruit. Residues of monocrotophos in orange leaves decreased from 180 to 1-2 ppm within 60 days of spraying. Application of the higher concentration resulted in twice as high residues in the leaves which were still measurable at 60 days after spraying. Monocrotophos residues dissipated much faster in lemon than in orange trees. No detectable amounts of monocrotophos were found in fruits analyzed 90 to 120 days after spraying. During the period from spraying to 60 days after spraying the residues in fruit decreased from 2.2 to 0.7 ppm, with most of the decrease occurring during the first week. There was a definite decrease in the level of monocrotophos detected in the rind. However, the residues of monocrotophos in the pulp were almost the same 21 or 60 days after spraying.

76-1893. Khurie, A. Zh.; Kalinin, V. A. (Department of Chemical Means of Plant Protection, Timiryazev Agricultural Academy, USSR). **Vliyanie temperatury i ul'trafioletovogo izlucheniya na stabil'nost' sayfosa v laboratorynkh usloviyakh. {Effect of temperature and ultraviolet light on the stability of sayfos under laboratory conditions.}** *Izv. Timiryazev S'kh. Akad.* 4: 222-224; 1975. (6 references) (Russian)

The effect of different temperatures and UV irradiation on the degradation of menazon (sayphos) was studied under laboratory conditions. Exposure to 50°C temperature for up to 12 hours in a dark chamber caused no degradation at all. The rates of decomposition were 14%, 32.6%, and 47.7% at 100°C after 30, 60, and 120 minutes, respectively, and 70%, 100%, and 100% at 150°C. UV irradiation for 5 minutes caused no degradation, while exposures for 10, 15, 30, 60, and 120 minutes reduced the percentage of intact menazon to 57%, 53%, 20%, 20%, and 17%, respectively. Irradiation for 2 hours generated three unidentified metabolites. Two of these metabolites have *Rf* values of 0.13+0.01 and 0.30+0.01, respectively.

76-1894. Yang, R. S. H.; Mueller, W. F.; Grace, H. K.; Golberg, L.; Coulston, F. (Inst. Compar. Hum. Toxicol., Albany Med. Coll., Albany, NY 12208). **Hexachlorobenzene contamination in laboratory monkey chow.** *J. Agric. Food Chem.* 24(3): 563-565; 1976. (22 references)

The presence of hexachlorobenzene contamination in some samples of Purina monkey chow was established on the basis of gas chromatographic and mass spectrometric evidence. Among some 30 batches of Purina monkey chow analyzed, the level of hexachlorobenzene ranged from less than 1 ppb to 21.1 ppm. Traces of hexachlorobenzene (HCB), estimated to be less than 1 ppb, were also present in several batches of Wayne monkey chow. (Author abstract reprinted by permission of the American Chemical Society)

76-1895. Betts, P. M.; Giddings, C. W.; Fleeker, J. R.* (Dep. Biochem., North Dakota State Univ., Fargo, ND 58102). **Degradation of 4-aminopyridine in soil.** *J. Agric. Food Chem.* 24(3): 571-574; 1976. (12 references)

The rate of 4-aminopyridine (4-AP) degradation was studied in soil and in pure cultures of five soil microorganisms. In three different soils, between 6 and 24% of the 4-AP-2-^{14}C applied was recovered as $^{14}CO_2$ after 60 days. When chopped corn containing 3% 4-AP-2-^{14}C was incubated 70 days on moist soil, 16% of the radioactivity was recovered as carbon dioxide. On incubation of 4-AP-2-^{14}C in flooded soils, 21 and 24% of the radioactivity was lost after 60 days in two different soils. Pure cultures of *Pseudomonas fluorescens*, *Enterobacter aerogenes*, *Aspergillus niger*, *Streptomyces griseus*, and *Agrobacterium tumefaciens* were unable to metabolize 4-AP to a significant extent during 120 h of incubation. The compound did not retard growth of these organisms at 100 μg/ml. (Author abstract reprinted by permission of the American Chemical Society)

76-1896. Finlayson, D. G.; Williams, I. H.; Brown, M. J.; Campbell, C. J. (Res. Stn., Agric. Canada, Vancouver, British Columbia, Canada). **Distribution of insecticide residues in carrots at harvest.** *J. Agric. Food Chem.* 24(3): 606-608; 1976. (14 references)

Carrots grown in muck soil and treated with the insecticides carbofuran (2,3-dihydro- 2,2-dimethyl-7-benzofuranyl methylcarbamate), ethion (*O,O,O',O'*-tetraethyl *S,S'*-methylene bisphosphorodithioate), fensul-

fothion (*O,O*-diethyl *O*-*p*-[(methylsulfinyl) phenyl] phosphorothioate), and phorate (*O,O*-diethyl *S*-[(ethylthio)methyl] phosphorodithioate), were sectioned, halved longitudinally, and peeled and the insecticide residues determined for whole carrots, sections of carrots, peel, and pulp. Residues for all insecticides were greater in the peel than in the pulp, and greater in the top portion of the carrot than in the lower sections. More than 50% of the residues of ethion, fensulfothion, and phorate were located in the top 0-3 cm of the carrot. Carbofuran residues in the same section were slightly less. Residue levels generally increased with higher rates and numbers of applications. Total residues in whole carrots ranged from 0.06 ppm for ethion at the lowest rate to 0.49 ppm for fensulfothion at the highest rate. (Author abstract reprinted by permission of the American Chemical Society)

76-1897. Heuer, B.; Birk, Y.; Yaron, B. (Div. Soil Residues Chem., Inst. Soils Water, Agric. Res. Org., Bet Dagan, Israel). **Effect of phosphatases on the persistence of organophosphorus insecticides in soil and water.** *J. Agric. Food Chem.* 24(3): 611-613; 1976. (17 references)

The degradation of some organophosphorus insecticides by phosphatases was studied in water, soil, and soil extract. There is an obvious effect of the phosphatases in solution, but no effect of the enzymes was noted on the insecticides which were absorbed on the soil surface, even after multiple enzyme applications. (Author abstract reprinted by permission of the American Chemical Society)

76-1898. Holmstead, R. L. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Studies of the degradation of mirex with an iron(II) porphyrin model system.** *J. Agric. Food Chem.* 24(3): 620-624; 1976. (24 references)

Mirex reacts with reduced hematin to yield products formed from reductive dechlorination which include mono-, di-, tri-, and tetrahydro derivatives as well as other more polar decomposition products. The decomposition is rapid with about half of the Mirex initially present being observed after ca. 13.9 min using an initial molar ratio of Mirex to hematin of 1:5. This iron(II) porphyrin system may serve as a model for understanding Mirex degradation under certain environmental conditions. (Author abstract reprinted by permission of the American Chemical Society)

76-1899. Taylor, A. W.; Glotfelty, D. E.; Glass, B. L.; Freeman, H. P.; Edwards, W. M. (Agric. Environ. Qual. Inst., Beltsville Agric. Res. Cent., Beltsville, MD 20705). **Volatilization of dieldrin and heptachlor from a maize field.** *J. Agric. Food Chem.* 24(3): 625-631; 1976. (20 references)

Dieldrin and heptachlor were applied at 5.6 kg/ha and mixed 7.5 cm deep in the soil immediately before maize planting on a 0.68-ha watershed at Coshocton, Ohio, on April 30, 1969. Vapor density profiles up to 4 m above the ground were measured on 7 days between May 2 and October 16. Vertical flux densities were calculated from eddy diffusion coefficients determined from simultaneous micrometeorological observations. Maximum flux intensities of 4.0 g/ha per day of dieldrin and 5.0 g/ha per day of heptachlor were observed on June 26th. Marked diurnal variations with noonday maxima were observed. Flux intensities declined to low values in October. Calculated seasonal losses were 199 g/ha of dieldrin and 383 g/ha of heptachlor. (Author abstract reprinted by permission of the American Chemical Society)

76-1900. Dorn, S.; Oesterhelt, G.; Suchy, M.* ; Trautmann, K. H.; Wipf, H. K. (Dr. R. Maag, Ltd., Biol. Lab., CH-8157 Dielsdorf, Switzerland). **Environmental degradation of the insect growth regulator 6,7-epoxy-1-(*p*-ethylphenoxy)-3-ethyl-7-methylnonane (Ro 10-3108) in polluted water.** *J. Agric. Food Chem.* 24(3): 637-640; 1976. (11 references)

The insect growth regulator (IGR) Ro 10-3108 was subjected to degradation in polluted water under natural environmental conditions. Analysis of the degradation products by gas—liquid chromatography (GLC), high-pressure liquid chromatography (HLC), and combined gas chromatography-mass spectrometry (GC-MS) led to the identification of 12 metabolites which were synthesized and confirmed by GC-MS and cochromatography. The major routes of degradation involve hydration of the 6,7-epoxy group, α oxidation of the *p*-ethyl moiety, and ether cleavage. None of the metabolites shows morphogenetic activity comparable to that of Ro 10-3108 in the *Tenebrio molitor*, *Aedes aegypti*, and *Adoxophyes orana* bioassays. (Author abstract reprinted by permission of the American Chemical Society)

76-1901. Hearnsberger, A. P.; Kilgore, L. T.; Rogers, R. W. (Animal Sci. Dep., Mississippi State Univ., Mississippi State, MS 39762). **Degradation of 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl) ethane (DDT) in beef by canning and cooking.** *J. Agric. Food Chem.* 24(3): 677-678; 1976. (14 references)

Naturally contaminated beef samples containing 5 and 8 ppm of total DDT (DDE, DDD, and DDT) were processed and cooked by two different methods. Both processing methods (104°C, 137 min; 126.7°C, 66 min) reduced total DDT in the fat of beef. A mean loss of 20% occurred in fat below tolerance and a 10% loss in the fat above the tolerance level. Cooking by microwaves or in a conventional oven resulted in a 17% further loss. (Author abstract reprinted by permission of the American Chemical Society)

76-1902. Silber, J.; Previtali, C.; Silbera, N. (Univ. Nac. de Rio Cuarto, Dep. Quim. Fis., Rio Cuarto, Cordoba, Argentina). **Photoreactions of riboflavin in the presence of 2,4-dichlorophenoxyacetic acid (2,4-D).** *J. Agric. Food Chem.* 24(3): 679-680; 1976. (7 references)

Aerobic photolysis of aqueous buffered solutions of 2,4-dichlorophenoxyacetic acid (2,4-D) and riboflavin (RF) was studied. A 100-fold excess of 2,4-D with respect to RF concentration was used in every case. Spectroscopic and TLC analysis of reaction products showed that RF decomposes in the presence of 2,4-D. No detectable decomposition of 2,4-D was observed, even after 22 h of photolysis. Lumichrome, the principal photoproduct of RF in these conditions, was inhibited by 2,4-D. The rate of RF photodecomposition and lumichrome inhibition increased with 2,4-D concentration. The implication of these results on the possibility of a photodegradation of the herbicide via a sensitization by RF is discussed. (Author abstract reprinted by permission of the American Chemical Society)

76-1903. Salem, H. A.; Waskey, C. E.; Wilson, B. B. (Virginia State Coll., Petersburg, VA). **Effect of KOH on DDT in animal feeds.** *J. Anim. Sci.* 39(5): 1001; 1974.

The effect of potassium hydroxide (KOH) on the reduction of DDT to less harmful analogs was studied in 6 sheep averaging 55 kg each. Experiments lasted for 19 days, after which the animals were fasted for 48 hr to determine DDT retention. One pair of animals received 12.5% protein diet sprayed with DDT solution, 1.26 mg DDT/kg feed; a second pair received the same DDT containing diet after it had been sprayed with 7.19 g KOH in water/100 kg feed. The third pair received the DDT containing diet treated with 35.90 g KOH in water/100 kg feed. Rumen and blood samples were taken the day before the study and then on days 9, 12, and 19 of the study. DDT levels in the blood were increased for all pairs after 8 days. On the 12th and 19th days, DDT levels in blood decreased to 0 in animals receiving KOH. In the rumen there were higher DDT levels and lower DDD levels for sheep fed the DDT control diet, while the reverse was true for those receiving KOH. During the experiment, 18.39% of the DDT and its metabolites were excreted in the feces and 31.21% in the feces and urine of the low and high KOH-treated diets, respectively.

76-1904. Downey, W. K.; Flynn, M. P.; Aherne, S. A. (Nat. Sci. Council, St. Martin's House, Dublin, Ireland). **Organochlorine content of milks, dairy products and animal feed ingredients: Ireland 1971-1972.** *J. Dairy Res.* 42(1): 21-29; 1975. (33 references)

Analyses for organochlorine insecticide residues were made using electron-capture gas chromatography in bovine and human milks, as well as butter, cheese, skim and whey powders, calf-replacer, casein, butter-oil, and dietetic food collected throughout Ireland during 1971-1972. Samples were also taken of 10 major animal feed ingredients. Low or negligible levels of chlorinated insecticides were found in the different samples. DDT residues were generally the predominant contaminants detected together with lower levels of lindane, aldrin/dieldrin, and heptachlor/heptachlor epoxide. Maximum levels of these insecticides in bovine milk and dairy products were 511, 100, 62, and 21 μg/kg fat, respectively, and constituted only 50% or less of the Codex Tolerance Limits. Correspondingly low residues were found in human milk, 128, 1, 1, and 5 μg/kg fat, respectively, which represents insecticidal ingestion by infants equivalent to 13, 0.05, 5, and 5%, respectively, of the WHO/FAO acceptable daily intake. Animal feed samples also contained trace levels of these substances. The need for establishing tolerance limits for insecticides in animal feeds is discussed.

76-1905. Johnson, J. M.; Dollar, A. M.; Cox, D. C. (Univ. Hawaii Sch. Pub. Health, Honolulu, Hawaii). **Mirex monitoring in Hawaii—monitoring requirements.** *J. Environ. Health* 38(5): 343-344; 1976.

Several issues are discussed in relation to the imposition of national concerns on local situations, particularly when those situations differ greatly from those pertaining to the temperate continental states. The suitability of automatically establishing pesticide limitations or bans on a nationwide basis is questioned. Application practices are important in terms of the amount of pesticide reaching aquatic and terrestrial food webs. Mirex was applied in Hawaii by either boom or low-level aerial methods only to pineapple fields in which field ant activity was evident. In order to control the fire ant, Mirex was applied to the Southeastern United States without apparent concern for its transport by water in channels. Many applications were made over marshes, bayous, and other wetland areas. Other pesticides approved for pineapple field application at the time included chlordane, heptachlor, and malathion. Other factors reviewed in the report include the sampling of low pest population densities, the cost of sampling such densities, the comprehensiveness of the samples, the importance of a close and harmonious community-university relationship, and a consideration of the question of when the ecological damage caused by a monitoring program outweighs the benefits derived from the data accumulated.

76-1906. Averitt, W. K.; Gangstad, E. O. (Dep. Chem. Eng., Univ. Southwestern Lousiana, Lafayette, LA 70501). **Dissipation of residues of 2,4-D in static water.** *J. Environ. Qual.* 5(2): 145-147; 1976. (12 references)

The rate of dissipation of residues of 2,4-D (2,4-dichlorophenoxy acetic acid) at the point of application for control of aquatic vegetation was found to be affected by the rate of treatment, depth of water, mean temperature, and time after treatment. For the standard rate of treatment, i.e., 4.48 kilograms acid equivalent per hectare (kg ai/ha) there was a decrease of 58 parts per billion (ppb) in residue for each 0.61 m increase in depth of water treated, a decrease of 115 ppb in residues for each 7°C increase in mean temperature, and a decrease of 53 ppb in residue for each 7-day interval of time after treatment. (Author abstract by permission)

76-1907. Guenzi, W. D.; Beard, W. E. (Agric. Res. Serv., Western Region, Ft. Collins, CO 80522). **Picloram degradation in soils as influenced by soil water content and temperature.** *J. Environ. Qual.* 5(2): 189-192; 1976. (16 references)

A laboratory experiment was designed to determine the effect of temperature and alternating incubations at field capacity and during drying periods on the degradation of picloram (4-amino-3,5,6- trichlorpicolinic acid) in five soils. Picloram was added at a rate of 10 ppm, and degradation was measured by $^{14}CO_2$ evolution resulting from the cleavage of the labeled carboxyl carbon. Picloram degraded very little at 5°C and increased only slightly up to 25°C. Three soils were highest in degradation rates at 30°C while two soils were highest at 50°C. Picloram degradation rates during 20-day incubation periods at field capacity, interrupted with 16-day drying cycles, varied among soils and decreased after each successive drying cycle at 30 and 50°C, except for one soil at 50°C. The degradation rate decreased gradually as water content decreased from field capacity (0.33 bar) to 15 bars tension, and ceased after the soils were air dried. (Author abstract by permission)

76-1908. Clapp, D. W.; Naylor, D. V.; Lewis, G. C. (Idaho Dep. Water Resour., Statehouse, Boise, ID). **The fate of disulfoton in Portneuf silt loam soil.** *J. Environ. Qual.* 5(2): 207-210; 1976. (9 references)

The formation of metabolites of disulfoton (*O,O*-diethyl *S*-[2-(ethylthio) ethyl] phosphorodithioate) was followed in a Portneuf silt loam soil. The insecticide oxidized to its sulfoxide and sulfone but none of its oxygen analogs were detected. The disulfoton and disulfoton sulfoxide degraded in 32 days or less while the disulfoton sulfone persisted for more than 64 days. The influences of soil moisture content, temperature, and disulfoton concentration were found to be interrelated in their effects on the rate of disulfoton dissipation and sulfone formation. In general, the most rapid degradation of disulfoton on a percentage basis occurred at lower initial concentrations of disulfoton, irrespective of the moisture content of the soil and the temperature, and the slowest degradation occurred at higher initial levels of disulfoton in association with higher moisture levels and high or low temperatures. The conditions for the greatest percent conversion of disulfoton to its sulfone generally coincided with the conditions of the most rapid dissipation of the disulfoton. (Author abstract by permission)

76-1909. Walker, W. W. (Microbiol. Sect., Gulf Coast Res. Lab., Ocean Springs, MS 39564). **Chemical and microbiological degradation of malathion and parathion in an estuarine environment.** *J. Environ. Qual.* 5(2): 210-216; 1976. (28 references)

Malathion was essentially completely degraded during 18 days incubation in sterile and nonsterile water, while respective parathion losses ranged from 16 to 23% after 40 days. Malathion abatement was in direct proportion to increasing salinity, while parathion was quite persistent, even in high salinity (25 parts per thousand [ppt]) water. Microorganisms capable of degrading malathion and parathion were isolated from insecticide-enriched sediment. Four bacteria isolated from malathion-enriched sediment readily degraded malathion, one to malathion half-ester and another to malathion dicarboxylic acid through the half-ester intermediate, and three bacteria isolated from parathion-enriched sediment were efficient in parathion metabolism. One bacterium isolated from parathion-enriched sediment was capable of degrading malathion to the di-acid through the half-ester intermediate. (Author abstract by permission)

76-1910. Joshi, O. P.; Datta, N. P. (Nucl. Res. Lab., Indian Agr. Res. Inst., New Delhi, India 110012). **Present day concepts on the behaviour of simazine in soils and plants.** *J. Sci. Ind. Res.* 34(9): 505-510; 1975. (209 references)

This review considers recent literature on the behavior of simazine in soils and plants. The effects of soil organic matter, the clay fraction of the soil, and the physical and physicochemical conditions of the soils on simazine behavior are discussed. Also included in this review are studies concerned with the movement of simazine in soils, the breakdown of simazine in soils, volatilization losses, persistence and residual effect, effect of simazine on soil microorganisms, degradation of simazine by plants, and simazine and plant growth in soils. It is noted that, in spite of the large number of investigations carried out, the simazine-soil-plant interaction, especially under tropical and subtropical conditions, remains an open question.

76-1911. Vyas, S. C.; Nene, Y. L. (Dep. Plant Pathol., J.N.K.V.V., Jabalpur-482004, India). **Degradation of thiram on treated seed in storage.** *JNKVV Res. J.* 7(3): 181; 1973. (8 references)

Seeds of Swarna variety of sorghum and G-130 variety of gram were treated with 0.15, 0.30, and 0.45% technical thiram and stored in cloth bags lined with polyethylene at different relative humidities. Seeds were sampled at ten day intervals. The *Rf* value and maximum absorbance of thiram extracted from seed were 0.5 and 440 nm, respectively; these values were similar to those of the reference thiram. These values were unchanged throughout the course of the investigations. These results suggest that thiram does not become chemically degraded at different RH in storage after seed treatment. The loss of thiram from gram and sorghum seeds reported by Vyas and Nene and on sorghum by other investigators may be due to physical degradation, which merits further investigation.

76-1912. Matsumoto, M.; Oe, T. (Kyoto Munic. Inst. Public Health, Kyoto, Japan). **[Results of survey of pollution of fishes in Kyoto City rivers by polychlorobiphenyl and organochlorine pesticides.]** *Kyoto-Shi Eisei Kenkyusho Eiken Nenpo (Annu. Rep. Kyoto Munic. Inst. Public Health)* 41: 46-51; 1975. (Japanese)

Fish (*Zacco platypus*) in 8 Kyoto City rivers were collected at 13 points. The PCB and organochlorine pesticide contents were determined. The findings revealed that the total DDT content was larger than the total BHC content, and the latter was larger than dieldrin. The levels of DDE and DDD were far higher than that of the parent compound, DDT. Of the BHC isomers, the β-BHC content was a little larger than that of the other isomers. Residue levels (ppm) were α-BHC (0.003-0.095), β-BHC (trace-0.47), γBHC (0.003-0.029), *p,p'*-DDE (0.09-0.44), *p,p'*-DDT (0.008-0.054), *p,p'*-DDD (0.05-0.34), and dieldrin (0.001-0.075).

76-1913. Anonymous. **[Results of survey of pollution of human milk by polychlorobiphenyls and organochlorine pesticides.]** *Kyoto-Shi Eisei Kenkyusho Eiken Nenpo (Annu. Rep. Kyoto Munic. Inst. Public Health)* 41: 52-53; 1975. (Japanese)

Twenty-six specimens of human milk collected from nursing mothers 3 mo after delivery (ages 23 to 33 yr) were analyzed for polychlorobiphenyls (PCB) and organochlorine pesticides. The average total DDT (*p,p'*-DDT plus DDE) content was 0.061 ppm (range 0.019-0.116 ppm); the average total BHC content (α-, β- and γ-BHC) was 0.067 (range 0.014-0.161 ppm). Total DDT and total BHC showed clear reductions. The content of *p,p'*-DDE was 0.04 ppm (on the average), which was about half of the 1971 value. However, that of *p,p'*-DDT was 0.021 ppm (on the average), thus nearly equal to that from 1971 (0.019 ppm). β-BHC accounted for 98% of the total BHC. The content of total BHC was about half that of 1971.

76-1914. Raguraj, R.; Rajukkannu, K.; Thirumurthi, S.; Asaf Ali, K.; Krishnamoorthy, K. K.; Subramaniam, T. R. (Tamil Nadu Agric. Univ., Coimbatore—641003, India). **Estimation of carbaryl insecticide residues on Bhendi fruits.** *Madras Agric. J.* 60(8): 1083-1084; 1973. (7 references)

Bhendi (eggplant) was sown on May 23, 1973 and carbaryl (sevin) 0.1% was sprayed at 1000 l/ha at the early formation stage of the fruits with a Knapsack sprayer. Composite fruit samples were taken on days 1, 3, 5, and 10 after spraying and the fruits were analyzed. The results showed that after 24 hr there was a residue of 14.40 ppm, which is above the safe limit of 10.0 ppm for carbaryl. However, this residue fell below 10.00 ppm on the 3rd day after spraying. The residue continued to decline and on the 10th day it was 4.80 and 1.24 ppm by chemical and bioassay techniques, respectively. Thus it is concluded that the fruits which were sprayed with 0.1% carbaryl can be consumed 2 days after spraying.

76-1915. Komar, M.; Jan, J.; Milohnoja, M. (Dep. Vet., Fac. Biotech., Ljubljana, Yugoslavia). **Klorirani ugljikovodici u maslacu inozemne proizvodnje. [Chlorinated hydrocarbons in butter produced outside Yugoslavia.]** *Mljekarstvo* 22(5): 107-110; 1972. (4 references) (Serbo-Croatian)

Chlorinated hydrocarbon pesticide levels were determined in butter produced outside Yugoslavia. The levels in imported butter were contrasted with the levels in butter sold outside Yugoslavia. Fifty-three brands of butter were tested, 22 imported to Yugoslavia and 31 sold abroad. Extraction and cleanup were performed according to the accepted methods, followed by gas chromatographic analysis. The 22 brands of butter consumed abroad generally met the standards established in the Yugoslavian tolerance regulations. They contained an average of 0.045 ppm α-BHC, 0.005 ppm γ-BHC (lindane), 0.06 ppm *p,p'*-DDE, 0.011 ppm *p,p'*-DDD (TDE), 0.023 ppm *p,p'*-DDT, no *o,p'*-DDT, and 0.005 ppm dieldrin. Thus 86.3% of the specimens failed to meet the tolerance for α-BHC, which is set at zero in Yugoslavia, and 21% exceeded the established levels for total DDT. Corresponding values for butter consumed in Yugoslavia were α-BHC (average) 0.106 ppm, γ-BHC (lindane) 0.044 ppm, *p,p'*-DDE 0.083 ppm, *p,p'*-DDD 0.021 ppm, *p,p'*-DDT 0.124 ppm, *o,p'*-DDT 0.005 ppm, total DDT 0.242 ppm, and dieldrin 0.03 ppm. As many as 96.8% of the samples tested failed to meet the zero tolerance established for α-BHC, and 28.1% exceeded the tolerance for total DDT. Thus the imported butter contained lower pesticide levels than that consumed in Western European countries in many cases. It is suggested that butter be labeled with the country of origin and that the unrealistic zero tolerance for alpha-BHC be abolished.

76-1916. Schreier, K. (Staed. Kinderklin., D-8500 Nuernberg, Germany). **Die Gefaehrdung des Kindes durch moderne Nahrungsmittel. [The danger to the child from modern foodstuffs.]** *Monatsschr. Kinderheilk.* 122(7): 523-527; 1974. (16 references) (German)

The sources of certain hazardous substances in foods are discussed. The major contaminants are pesticides, nitrosamines (from nitrite and nitrate salts), and pollution (lead, mercury). Natural toxins, such as aflatoxin, are included. This review also covers improper eating habits (high fat and sugar intake) and their effects. Cessation of pesticide use would result in establishment of a "natural check" on human population, but this alternative is not acceptable to modern man. Therefore pesticides must be found which have the smallest possible negative effect on the environment. Following the prohibition of DDT and other chlorinated hydrocarbons, the pesticide levels in plants and animal products are declining. Pesticides can be divided into three groups on the basis of their persistence in foods. The organophosphates and carbamates are detectable for 1-12 weeks, chlorinated hydrocarbons and related compounds for 2-5 years, and heavy metals persist almost indefinitely. Prohibition of heavy metal contamination assumes primary importance from this viewpoint, within the framework of establishment of tolerance levels in general.

See also **76-2021** **76-2049** **76-2054**

76-1917. Mollenhauer, H. P. (Author address not given). **Hoechstmengen fuer Pflanzenschutzmittel-Rueckstaende. [Maxima for pesticide residues.]** *Alimenta* 13(5): 171-175; 1974. (10 references) (German)

The subject of pesticide residues and tolerances is discussed. The tolerances are applied to not only those chemicals used to protect crops in the field but also those applied in storage and on the way to the market; this includes imported as well as domestic foods. The concept of "calculated risk" recognizes the necessity for pesticide use as well as the need for minimizing the threat presented to human health. A variety of toxicologic and other test techniques are used in determining the acceptability of a given pesticide use. The concept of good agricultural practice probably delineates the weakest point in the scientific foundations for decisions on tolerances, as all the assumptions made in discussing this point are controversial. In cases where conflicting tolerances and exemptions exist, excessively contaminated products may be imported. Though the establishment of tolerances is troublesome, it is indispensable at present.

76-1918. Bermejillo, M. (Author address not given). **Coloquio sobre las ponencias desarrolladas con el tema "Contaminacion ambiental." [Conference on the problems presented by environmental contamination.]** *An. R. Acad. Nac. Med. Madrid* 92(2): 297-313; 1975. (Spanish)

Texts are presented of papers delivered by six academy members at the Fifth Scientific Session of the Royal National Academy of Medicine of Spain. Most of the presentations dealt with air, water, and noise pollution. The final address concerned harmful effects of pesticides (DDT, organophosphates, and carbamates) on organisms in the food web. DDT and lindane have been reported to damage the blood and hematopoietic organs. DDT accumulates in human adipose tissue. Legislation regulating pesticides in Spain to date has specified worker protection procedures and established danger classes for available compounds.

76-1919. Wolff, J. (Author address not given). **U.S. Government regulations for pesticide use with special emphasis on analytical chemical aspects.** *IN: Analytical methods for pesticides and plant growth regulators. VIII. Government regulations, pheromone analysis, additional pesticides.* Academic Press, Inc., New York, 1976, pp. 3-30. (29 references)

This chapter details the registration process for pesticides. Tolerance setting procedures are also discussed with emphasis on the nature of residues; validation of methods; and the magnitude of food residues for corn and corn products, and for derived animal products. The handling of applications for registrations and petitions for tolerances is described. The relation between the food and drug administration and the EPA is considered. Information is given on the Federal Environmental Pesticide Control Act of 1972 (FEPCA Public Law 92-516), including provisions and impact of the law. Monitoring activities of federal agencies dealing with the food supply and the environment are presented including soil, water, fish and shellfish, and birds.

76-1920. Almeida, W. F. (Anim. Biol. Div., Biol. Inst., Sao Paulo, Brazil). **Tolerancia de residuos de pesticidas ao nivel internacional. [International tolerance levels for pesticide residues.]** *Biologico* 39(7): 188-189; 1973. (Portuguese)

World Health Organization and FAO boards of experts meet annually to evaluate the toxicological aspects of pesticide residues in foods. More than 100 pesticides have been studied to date. International tolerance levels have also been established by the Pesticide Residues Commission of the Codex Alimentarius, which has had delegates from 94 countries thus far. Brazil has been represented by a single delegate, in contrast to some other countries that have sent a whole group of experts. Many pesticides are used in Brazil on tropical crops, and residue data is often minimal or even non-existent. Brazilian climate and agricultural procedures call for a different quantity and frequency of pesticide application than colder climates. Higher temperatures could also contribute to a more rapid degradation of the pesticide. More accurate data must be obtained for use by the Brazilian delegates when attending Codex meetings. The formation of a Latin American Commission on Pesticide Residues would permit the region to present a solid front at Codex meetings. Brazil, Argentina, Mexico and some other countries interested in the creation of such a commission met in Brazil in April 1972, and a second meeting was scheduled for Sept. 1973 in Buenos Aires.

76-1921. Gaeta, R. (Toxicol. Comp. Hyg. Dep., Inst. Biol. Sao Paulo, Brazil). **Riscos e controle de individuos expostos a acao dos pesticidas. [Risks and surveillance of individuals exposed to the action of pesticides.]** *Biologico* 40(9): 271-227; 1974. (11 references) (Portuguese)

Clinical aspects of poisoning caused by pesticides in humans, possibilities for preventive instruction of exposed workers, and contamination with DDT residues are discussed in a review article; therapeutic directives are also given. Following a brief description of accidental poisonings with organophosphorus pesticides, especially parathion, due to carelessness of the vendor and buyer, the main symptoms induced by acetylcholine accumulation, of muscarinic/nicotinic types, and their rapid onset (2-4 hr after contamination of the skin; 15-60 min after ingestion), are described. The importance of diagnostic laboratory tests with special emphasis on the determination of cholinesterase levels in plasma and RBC is stressed. The detection of pesticide metabolites in the urine (such as *p*-nitrophenol, a metabolite of parathion, chlorthion, and EPN, and 1-naphthol and isopropoxyphenol for carbaryl and propoxur) is used to determine the identity of the poisoning pesticide. Restoration of respiration and correction of hypoxia, atropine therapy (initially 2-4 mg i.v.,

repeated every 5-10 min until signs of improvement appear) associated with oxime therapy (usually pralidoxime: 1 g in 250 ml saline solution, i.v. perfusion/30 min, or in 5% aqueous solution by slow i.v. injection for at least 2 min, with smaller doses administered to children), decontamination (washing of the skin or gastric lavage), and investigation of the site of poisoning are the four methods of treatment recommended. Periodic checking of cholinesterase and urinary metabolites, use of protective clothing, and training of exposed workers are suggested. Studies on DDT contamination showed no severe human toxicity problems.

76-1922. Laithwaite, J. A. (Law Hosp., Carluke, Lanarkshire, England). **Paraquat poisoning.** *Br. J. Clin. Pract.* 30(3): 71-73; 1976. (7 references)

This paper describes paraquat poisoning in a 32 yr old male, characterized by severe pulmonary involvement. The young man drank in excess of 20 ml of 20% paraquat and was hospitalized 6 days later. Prednisolone was started at 100 mg/day with a broad spectrum antibiotic. Even though his urinary output was good, he was given 80 mg frusemide/day for 3 days and a high fluid intake was maintained. Oxygen therapy was deliberately withheld. His condition deteriorated. He was orthopnoeic and the blood gasses deteriorated further. He also developed a marked hypokalemia, perhaps due to combined effects of steroids and diuretics and also possibly a renal losing defect. Potassium supplements and triamterene were successful in treating this. Azathioprine was given at a dose of 50 mg q.d.s. with potassium aminobenzoate four 1/2 g capsules q.d.s. as an antifibrotic agent. Immunosuppressants were discontinued when the patient was discharged. He was put on a maintenance dose of steroids and the potassium aminobenzoate administration was expected to continue over a long period.

76-1923. Kolesar, D.; Romancik, V. (Fac. Med., Komenski Univ., Bratislava, Czechoslovakia). **Klinicky a laboratorny obraz akutneho poskodenia meziproduktimi herbicidu Burex. [Clinical and laboratory findings in acute injury by precursors of the herbicide Burex.]** *Bratisl. Lek. Listy* 64(2): 132-140; 1974. (8 references) (Slovak)

Burex (pyrazon) herbicide is widely used for protection of the sugar beet crop. When Burex production was initiated in Czechoslovakia, a number of cases of worker injury occurred. Clinical and laboratory findings are reported for seven workers injured by the Burex precursors PCC (1-phenyl-4,5- dichlopyridazone-6) and MCA (mucochloric acid). Contact with these substance produced acute local irritation which gradually developed the character of a second-degree burn. Six to ten days later, when the local changes were beginning to resolve, systemic manifestations began. They were mainly characterized by digestive disorders and by slight liver enlargement in patients with more extensive local injuries. Certain biochemical factors were altered in all patients; SGPT and LDH were increased and serum proteins, mucoproteins, and protein fractions were abnormal for up to 2 months. Photosensitization was also noted.

76-1924. Liska, D.; Kolesar, D.; Raiskup, J. C.; Ballog, O. (Dep. Hyg., Inst. Med. Pharm., 88201 Bratislava, Czechoslovakia). **Klinicke a laboratorne nalezy u leteckotechnickeho personalu, profesionalne exponovaneho pesticidom. [Clinical and laboratory findings in aviation personnel professionally exposed to pesticides.]** *Bratisl. Lek. Listy* 64(2): 141-149; 1974. (19 references) (Slovak)

It has become increasingly important to find ways to protect personnel professionally exposed to pesticides. Pilots and mechanics of aircraft are one group highly exposed to these chemicals. During 1970-1971, a group of pilots and mechanics were observed and effects were assessed on organs and biological systems. Twelve pilots and 8 mechanics were observed; the average age was 36.7 yr, average length of exposure 7.6 yr, and average seasonal exposure 11.7 days, 3.5 hr/day. Bradycardia and hypotension were present and central nervous system functions were slightly altered. Changes in lability of the vegetative nervous system were found. The erythrocytes, plasma, and serum proteins were affected after exposure to organophosphorus insecticides. The subjective symptoms in the personnel were: headache, tiredness, vomiting, stomachache, stomatitis, difficulty in sleeping, and loss of memory.

76-1925. Stepanek, O. (Regional Hygienics Center, Chrudim, Czechoslovakia). **Moznosti likvidace nekterych ochrannych chemickych pripravku (pesticidu) v technologickem zarizeni cementarny. [The possibilities for destruction of some pesticides in the technological equipment of cement works.]** *Cesk. Hyg.* 19(9): 437-441; 1974. (2 references) (Czech)

The experience of several years in the destruction of unwanted pesticides: organochlorines, organophosphates, DNOC, etc., by combustion in a rotary kiln were discussed. The rotary kiln used had dimensions of 120 × 3.6 m. Pesticides were placed in the upper end of the kiln, above which is the smokestack. The pesticides then went through three processes: drying and heating, calcining, and burning. At the clinker end of the kiln, after combustion, air was permitted to escape. The heat inside the thoroughly-lined kiln was 1350-1450°C. The process lasted three hours. It was observed that no pesticide residue remained afterwards; the danger of contamination of air and water was found nonexistent. In addition the walls of the kiln provided further protection. It was concluded that the above method was hygienically safe for municipal and industrial use.

76-1926. Raloff, J. (Author address not given). **The kepone episode.** *Chemistry* 49(4): 20-21; 1976. (1 reference)

In March 1974, the Life Science Company in Hopewell, VA, began manufacture of the pesticide kepone (chlordecone) for Allied Chemical Corp. During the 16 mo that the plant operated, 149 employees came into contact with kepone. About 60 of them have been hospitalized with kepone-induced nerve damage, the symptoms of which include tremors, loss of memory, slurred speech, severe weight loss, and joint pain. A child of one employee was born with traces of kepone in its blood, and signs of poisoning were observed among relatives and even pets of employees. Previous studies at the Medical College of Virginia had indicated that kepone was toxic and possibly carcinogenic, although everyone involved in its manufacture denied knowledge of its dangers. Air and water samples taken 40 miles away from Hopewell show traces of kepone, and much of the James River and its tributaries have been closed to fishing because of contamination. Workers, fishermen, and others are seeking legal compensation for kepone contamination.

76-1927. Thurlbeck, W. M.; Thurlbeck, S. M. (Midhurst Med. Res. Inst., Midhurst, Sussex, England). **Pulmonary effects of paraquat poisoning.** *Chest* 69(2): 276-280; 1976. (6 references)

The lungs were examined of 3 patients who died 9 to 22 days after suicidal ingestion of paraquat. Also the acute pulmonary effects of paraquat in rats were studied to determine the effectiveness of the morphologic lesions as an assay system for paraquat poisoning. The results of the animal studies indicate that paraquat-treated animals can be distinguished regularly from experimental animals 24 hr after administration of paraquat, and probably even at 14.5 hr. Before this time the lesions are not consistently found in paraquat-treated animals, but marked pulmonary congestion was noted in some. It is also suggested that the early phase of paraquat poisoning is different from early oxygen poisoning where damage to endothelial cells plays so prominent a part. The pathogenesis of the subacute lesions noted in human lungs appeared to present two distinct forms of fibrosis. One was characterized by formation of microcysts and interstitial fibrosis, likely brought about by alveolar wall destruction. The other was characterized by the formation of abundant loose fibrous tissue within alveolar spaces, perhaps representing the organization of protein-rich edema fluid which pours into alveoli at an early stage of paraquat poisoning.

76-1928. Cooper, P. (Pharm. Soc. Great Britain, London, England). **Antidoti per sostanze velenose e stupefacenti. [Antidotes for poisonous substances and drugs.]** *Chim. Ind.* 58(2): 121-124; 1976. (Italian)

The primary substance used in cases of organophosphate intoxication is atropine, which is injected in large doses, at intervals, in order to maintain an adequate respiratory function. If poisoning is very serious, a reactivator of cholinesterase activity can be administered (pralidoxime methanesulfonate) within 12 hours of the appearance of symptoms. Usually, a dose consists of 1 g of pralidoxime in 6 ml of water and is injected i.v. If necessary, it can be repeated each hour for 24 hours.

76-1929. Kutty, K. M.; Jacob, J. C.; Hutton, C. J.; Davis, P. J.; Peterson, S. C. (Dep. Pathol., Dr. Charles A. Janeway Child Health Cent. Fac. Med., Memorial Univ., St. John's, Newfoundland, Canada). **Serum beta—lipoproteins: studies in a patient and in guinea pigs after the ingestion of organophosphorus compounds.** *Clin. Biochem.* 8(6): 379-383; 1975. (13 references)

The clinical presentation of a 10-yr old boy with parathion poisoning and consequent reduction in serum cholinesterase activity provided the opportunity to study the low density lipoprotein changes as a result of the enzyme inactivation. Changes in the patient were simulated in guinea pigs by administering the organophosphorus compound cholinesterase inhibitor, phospholine iodide. The boy was treated about 12 hr after ingestion of the poison with atropine and pralidoxime chloride and clinically recovered within 96 hr of admission. At admission the patient's serum cholinesterase activity was not detectable, and the low density lipoprotein and cholesterol levels were markedly decreased. Monitoring of the cholinesterase levels in the patient and in the guinea pigs allowed the following conclusions. The effect of the organophosphorus compound on cholinesterase inhibition or synthesis affects LDL production as well. Cholinesterase has an apparent function in LDL synthesis. Whether the involvement lies at the site of apolipoprotein synthesis, the assembling of lipids to the apolipoprotein, or in the release of formed lipoprotein from the liver in the circulation is not yet known.

76-1930. Jung, H. D. (Bezirksinspekt. Gesundheitssch. Betrieb., Neubrandenburg, DDR). **Berufliche Kontaktekzeme durch Bercema Zineb 80 (Zinkaethylen-1,2- bisdithiocarbamat) in der Landwirtschaft. [Occupational contact eczemas due to Bercema zineb 80 (zinc ethylene-1,2-bis-dithiocarbamate) in agriculture.]** *Dtsch. Gesundheitsw.* 31(12): 573-576; 1976. (26 references) (German)

Two cases of contact eczema due to occupational exposure to Bercema zineb 80 (zinc ethylene-1,2- bisdithiocarbamate) are reported. A 57-yr-old tractor driver was first sensitized while changing a tire in a storage area contaminated with this fungicide, and eczema developed several weeks later, following repeated contact with Bercema zineb 80-treated potato plants. Another 46-yr-old woman developed contact eczema of the lower limbs following working in a potato field sprayed with Bercema zineb 80 and Agrosan 14 days earlier. The skin sensitization tests definitely identified Bercema zineb 80 as the causative agent in both cases. The aggressive effect of zineb on the skin may be due to its hydrolysis or oxidation to the aggressive ethyleneisothiocyanate. Carbamates, dithiocarbamates, and phenylurea derivatives, containing structures susceptible to *N*-nitrosation, may have a car-

cinogenic effect. The hazard of contact eczema makes it necessary to establish a waiting period after which work can be resumed on zineb-treated fields.

76-1931. Lovejoy, Jr., F. H. (Children's Hosp., Med. Cent., Boston, MA). **Kids in crisis: priorities in poisoning.** *Emerg. Med.* 8(5): 202-217; 1976.

The cholinesterase inhibitors, which include malathion, parathion, chlorthion, and similar insecticides, have the ability to destroy cholinesterase; this results in the bombardment of peripheral receptor sites with increased acetylcholine. Atropine is a specific antagonist for this group. The pediatric dose of atropine sulfate is 0.01 mg/kg of i.v. solution, mixed in a concentration of 0.4 mg/ml and administered every 2 to 5 min until the child is fully atropinized and then as needed to maintain atropinization. Adolescent dose is 2 to 3 mg/kg. The most vital points to be gotten across with any insecticide are the importance of removing the drug as completely as possible from the skin and then giving enough atropine to reverse those signs. The patient who has taken these insecticides appears with pupils constricted and is salivating and comatose.

76-1932. Anonymous. **In paraquat poisoning, persevere.** *Emerg. Med.* 8(6): 185,188,192; 1976.

A large dose of paraquat very rapidly produces massive pulmonary edema and hemorrhage, and the progressive respiratory failture may kill within the first week. However, even a trickle of this chemical can be lethal, killing differently and much more slowly than the large dose. At a week's time after a small dose, except for burns on the oral mucosa, the victim may be showing no symptoms. However, these burns will begin to ulcerate, urination will grow difficult as the kidneys are affected, and at the end of the first week the patient may be slightly jaundiced. As the urinary functions begin to return to normal, pulmonary complications develop. Complications include a delayed fibrotic process pathologically similar to the respiratory distress syndrome with hypoxemia, decreased lung volume, low lung compliance, and an impaired diffusion capacity for carbon monoxide. If the patient is treated before these pulmonary symptoms appear there is a chance. Vomiting should be encouraged. Fuller's earth, some 300 gm, given every 3 or 4 hr as a 30% solution should be given for the next 48 hr along with an effective cathartic. Bentonite may be used if Fuller's earth is not available. Forced diuresis with saline solution is good if the paraquat has been absorbed by the kidneys.

76-1933. Mikuni, I.; Suzuki, A. (Sch. Ophthalmol., Fac. Med., Uokai Univ., Isehara, Kanagawa, Japan). **[A case of ocular corrosion by a herbicide, paraquat dichloride.]** *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 70(4): 395-398; 1976. (11 references) (Japanese)

An unknown amount of diluted 100 fold solution of 24% paraquat dichloride entered the right eye of a 55 yr old farm wife while she was spraying. She washed her eye copiously with water and no subjective symptoms were noted for one day. Then injury symptoms developed, progressing from sensation of a foreign body in the eye to ocular congestion. This was followed by congestion and cloudiness of the conjuctiva, partial ablation of corneal epithelium, formation of a pseudomembrane on the palpebral conjunctiva, total ablation of corneal epithelium with visual acuity of 0.1, and absence of abnormality in eyelid skin, anterior chamber, crystalline lens, and ophthalmic pressure 10 days after the incident. Treatment comprised administration of chloromycin, predonin, mucofazin, atropine, betamethasone, and colistin. After 19 days the corneal epithelium had almost regenerated; however, slight swelling and partial ablation still remained. After 35 days, the subjective symptoms had almost disappeared and visual acuity was restored to 0.7. General symptoms did not appear, and there were no abnormal internal medical findings. Only a slight feathery turbidity remained from pupil to cornea at the 12 o'clock point without abnormalities in the vitreous humor and fundus.

76-1934. Usutani, S.; Nishiyama, K.; Sato, I.; Komiyama, S. (Dep. Public Health, Hirosaki Univ. Sch. Med., Hirosaki, Japan). **[Studies on the prevention of pesticide accidents in apple farm workers. Fundamental survey of labor and health supervision of farmers working in associations for cooperative pest control.]** *Hirosaki Igaku (Hirosaki Med. J.)* 27(3): 529-544; 1975. (5 references) (Japanese)

A questionnaire study was conducted to determine the status of health control for persons engaged in controlling disease and insect damage on apple crops. Sixty-one % of the questionnaires were collected from speed sprayers, and 62% from persons associated with fixed piping systems. The proportion of women and old people among those working in the groups with fixed piping systems was larger than those in the groups with speed sprayers. In some cases the pesticides were applied daily. The health control systems for the workers were poor, particularly in the area of protective clothing and physical examinations. In 1972 the occurrence of acute poisoning was 5.2% in the speed sprayer type groups, and 9.4% in the fixed piping systems. It is urged that tests and studies be established as early as possible to prevent further damage to workers by agricultural chemicals. Items which should be included in worker health programs are discussed.

76-1935. Furie, B.; Trubowitz, S. (Dep. Med., Sect. Hematol. Oncol., Upstate Med. Cent., State Univ. New York, Syracuse, NY). **Insecticides and blood dyscrasias: chlordane exposure and self-limited refractory megaloblastic anemia.** *J. Am. Med. Assoc.* 235(16): 1720-1722; 1976. (13 references)

A 56-yr-old man in prior excellent health began to experience tachycardia, night sweats, shortness of breath,

and fatigue after extensive exposure to the insecticide chlordane while exterminating termites in his office. The stool was positive for occult blood and the histologic appearance of the bone marrow showed evidence of dyserythropoiesis, eosinophilia, and megaloblastosis. Initial laboratory values were: hemoglobin, 5.3 g/100 ml; hematocrit, 15%; red blood cells, 1.7×10^6 mm^3; reticulocyte count, 0.4%; platelet count, 295,000mm^3; white blood cells, 3,7000/mm^3; and mean corpuscular red blood cell volume, 89μ^3. The patient was given a total of 14 units of packed red blood cells over a 3-mo period and treated with cyanocobalamin, folic acid, iron, and pyridoxine hydrochloride; he continued to have periodic spiking temperatures of 38.8-39.4°C, with prostration, chills, and sweat. Protected from further exposure to chlordane, however, the patient had a spontaneous remission. It is likely that the hematologic disease in this patient was caused by chlordane exposure.

76-1936. Green, V. A. (Children's Mercy Hosp., Kansas City, MO 64108). **Name your poison.** *J. Kans. Med. Soc.* 77(5): 197-201, 204; 1976. (29 references)

The acute toxicity of insecticides and herbicides is a continuing problem, but it rises sharply in incidence during the spring and summer months due to increased usage of these chemicals. There are two broad categories of insecticide poisons, chlorinated hydrocarbon derivatives, and cholinesterase inhibitors. The herbicides usually are halogenated derivatives of phenoxyacetic acid, triazine derivatives, alkyl urea derivatives, or metallic salt derivatives. The more prevalent halogenated hydrocarbons used as insecticides include the chlorobenzene, indane, and camphene derivatives, while the cholinesterase inhibitors are either pyrophosphates or carbamates. The chlorinated hydrocarbon insecticides cause nausea, vomiting, CNS stimulation, perspiration, confusion, malaise, and apprehension. Some produce tremors, irregular pulse, and hepatic and renal damage. All increase the myocardial sensitivity to beta adrenergic stimulants. Cholinesterase inhibitors cause a myriad of systemic effects as well. Herbicides exhibit less of a toxic threat than do the insecticides, but there is a potential for toxicity in most formulations. Triazine derivatives have produced no documented toxicity in man. A large number of chemical derivatives of borates and chlorates are herbicides which are more toxic than organic herbicides, causing corrosions if ingested or inhaled.

76-1937. Knyazev, A. F.; Kozlov, Yu. S.; Khomenko, L. I. (VNIIPAV, USSR). **Moyushchee sredstvo dlya ochistki mashin ot pestitsidov. [Cleanser for pesticide-contaminated equipment.]** *Maslob-Zhir. Promst.* 11: 29-30; 1975. (Russian)

Kompleks", a new synthetic detergent for cleansing pesticide-contaminated equipment, is described. The detergent is composed of soda ash (13%), sodium perborate (3%), sodium salts of synthetic fatty acids (5%), triethanolamine (5%), synthanol DS-10 (2%), DNS (5%), and water. Laboratory tests with 30 g/l concentration of "Kompleks" at 85°C showed decomposition of methylmercaptophos at a rate of 98% and of lindane at 80% in 4 hours. The decay products were of low toxicity.

See also **76-2006** **76-2049** **76-2059**

76-1938. Schewe, T.; Hiebsch, C.; Halangk, W. (Inst. Physiol. Biol. Chem., Humboldt-Univ., Berlin, Germany). **Zur Wirkung des Systemfungizids Dexon auf einige NADH-Dehydrogenasen. [The action of the systemic fungicide dexon on several NADH dehydrogenases.]** *Acta Biol. Med. Germ.* 34:1767-1776; 1975. (29 references) (German)

Dexon (fenaminosulf) inhibited the NADH oxidase activity of submitochondrial particles (ETP) from beef heart (semi-inhibition concentration of 1.4 μM), but the succinate oxidase activity was not affected. Evidence suggests that dexon acts directly on the flavin of NADH dehydrogenase. Dexon also inhibited soluble NADH-cytochrome c-oxidoreductase and rotenone-insensitive NADH ubiquinone reductase. Dexon, at low concentrations, inhibited ETP slowly only after the addition of NADH. Preincubation without NADH increased the inhibition, but did not prevent the time delay. An electron flux through the respiratory chain, or a reduction of flavin, are apparently prerequisite for the reaction of dexon with the action site. Dexon also inhibited NADH dehydrogenase located on the outer surface of the inner membrane of plant mitochondria, accessible to extramitochondrial NADH and insensitive to rotenone. Dexon also selectively inhibited the NADH dehydrogenase activity of DT diaphorase from rat liver cytosol. The dicumarol-insensitive NADH dehydrogenase from rat liver cytosol, the NADH-cytochrome b_5-reductase from rat liver microsomes, the rotenone-insensitive NADH-cytochrome c-oxidoreductase of the outer membrane of rat liver mitochondria, soluble NADH-oxidase from *Escherichia coli*, and NADH-dehydrogenase from human erythrocytes are not inhibited. It is suggested that dexon is a group reagent for certain pyridine nucleotide-dependent flavin enzymes.

76-1939. Selye, H.; Mecs, I. (Inst. Med. Chir. Exp., Univ. Montreal, Montreal, Quebec, Canada). **Effect upon drug toxicity of surgical interference with hepatic or renal function - Part I.** *Acta Hepato-Gastroenterol.* 21(3): 191-202; 1974.

Pregnenolone-16α- carbonitrile (PCN, 10 mg, bid, po) or triamcinolone (1 mg, bid, po) was given to male Sprague-Dawley rats and the effects on the toxicity of 175 drugs determined. A second experiment examined the effects of choledochus ligature, partial hepatectomy, and partial nephrectomy on the toxicity of the same 175 drugs. Drug treatment was begun four days after the beginning of PCN and triamcinolone treatment and one day after surgery. Among the toxicants tested were arsanilic acid (8-10 mg in DMSO, sid, sc), arsenic pentoxide (10-15 mg in water, given a single time po), DDT (17-25 mg in peanut oil, given a single time po), diisopropyl fluorophosphate (DFP, 180-250 μg in corn oil, given a single time po), EPN (470-700 μg in DMSO, given a single time ip), ethion (0.5 ml of a 0.8-1.2% solution in peanut oil, given a single time po), guthion (azinphosmethyl, 0.66-1.0 mg in DMSO, sid for 2 days, po), heptachlor (6.6-10 mg in DMSO, sid for 2 days, po), hexachlorobenzene (16.66-25 mg in peanut oil, bid, po), 1-naphthyl isothiocyanate (26.6-40 mg in water, given a single time po), octamethyl pyrophosphoramide (schradan, 0.66-1.7 mg in corn oil, given a single time sc), and warfarin (6.6-10 mg in water, bid, po). A few general laws were deduced.

76-1940. Richter, D.; Runde, H. (Paedagogische Hochschule Section Chem./Biol., Koethen, East Germany). **Die Wirkung phosphoroganischer Verbindungen auf die Darmesterases der Ratte - eine vergleichende histo- und biochemische Untersuchung. [Effect of organophosphorus compounds on esterases in rat intestine - a comparative histochemical and biochemical investigation.]** *Acta Histochem.* 54(1): 56-65; 1975. (20 references) (German)

The effect of demephion (methyl-demeton-methyl), methyl parathion, dimethoate, trichlorfon, and CKB 1028 on nonspecific esterases and cholinesterase in the intestines and serum of male Wistar rats was studied by in vitro histochemical and biochemical methods. The histochemical tests revealed an increase in the inhibition of intestinal nonspecific esterases in order: dimethoate, CKB 1028, demephion, trichlorfon, and methyl parathion. The inhibition rates for cholinesterases increased in the order dimethoate, CKB 1028, trichlorfon, methyl parathion, and demephion. Esterase inhibition was uniform for all intestinal structures. Photometric studies with acetylcholine nonspecific esterases: dimethoate, demephion, CKB 1028, trichlorfon, and methyl parathion. The corresponding order established for serum esterases is dimethoate, CKB 1028, trichlorfon, methyl parathion, and demephion. For comparison, human serum esterases are totally inhibited by demephion, trichlorfon, and methyl parathion, and 50% inhibited by CKB 1028. The order established for the serum esterases by the photometric method is the same as that found for the intestinal esterases.

76-1941. Maksimovic, M.; Stevanovic, M. (Inst. Tech. Med. Protect., Belgrade, Yugoslavia). **Chemical structure and anticholinesterase activity of organophosphorus inhibitors.** *Acta Pharm. Jugoslav.* 25(1): 19-25; 1975. (13 references)

A study was conducted to determine how cholinesterase (ChE) inhibition is affected by the steric properties of the inhibitor molecule or the hydrophobic action of the enzyme. Several new compounds were evaluated. Organophosphorus anticholinesterases with Et, Pr, *i*Pr, *i*Bu, Pe, *neo*Pe and Pin (pinacolyl) groups, carrying inorganic (F) or organic tertiary ($S\text{-}(CH_2)_2\text{-}N(CH_3)_2$) and quaternary ($S\text{-}CH_2)_2$ $(CH_3)_3$) acyl residues, possess inhibition rate constants which increase with the number of C atoms in the straight-chain series, but not with that of the branched-chain series, where tertiary butyl groups reduced the inhibition rate constant values. The correlation between activation energy and frequency factor suggests an important influence

of hydrophobic sorption of the organophosphorus inhibitors at the enzyme surface. Steric properties of alkyl radicals are extremely important.

76-1942. Lund-Karlsen, R.; Fonnum, F. (Norwegian Defence Res. Establishment, Div. Toxicol., Kjeller, Norway). **The effect of locally applied cholinesterase inhibitors and oximes on the acetylcholinesterase activity in different parts of the guinea-pig eye.** *Acta Pharmacol. Toxicol.* 38(4): 299-307; 1976. (25 references)

The activities of acetylcholinesterase and choline acetyltransferase were higher in the guinea-pig retina than in the guinea-pig brain, and were higher in the cornea, iris, and external eye muscles than in the striated muscles. Instillation of diisopropyl phosphorofluoridate (DFP), sarin, and paraoxon into the conjunctival sac was followed by rapid inactivation of the acetylcholinesterase in the cornea and iris, whereas the enzyme activities in the retina and external eye muscles were much less affected. The *de novo* synthesis of acetylcholinesterase in the iris and cornea was studied after irreversible inhibition of the enzyme by locally applied DFP, following which 50% of the enzyme activity returned in both regions within 7-10 days. Acetylcholinesterase inhibited by DFP, sarin, or paraoxon could be reactivated by locally applied toxogonin (obidoxime) or pyridine-2-aldoxime methyliodide (pralidoxime). Benzalkonium in 0.03% solution increased the degree of reactivation, probably by increasing the permeability of the cornea.

76-1943. Chkanikov. D. I.; Makeev, A. M.; Pavlova, N. N.; Artemenko, E. M.; Dubovoy, V. P. (All-Union Sci. Res. Inst. Phytopathol., Moscow Oblast, USSR). **Rol' metabolizma 2,4-D v proyavlenii ustoychivsti rasteniy k etomy gerbitsidu. [Role of 2,4-D metabolism in the manifestation of plant resistance to that herbicide.]** *Agrokhimiya* 2: 120-126; 1976. (21 references) (Russian)

In an experiment on the possible relationship between 2,4-D metabolism and the manifestation of resistance in plants to this pesticide, 14C-labeled 2,4-D was applied to the leaves of 25-day-old specimens of *Gossypium hirsutum, Helianthus annuus, Sinapis arvensis, Phaseolus vulgaris, Glycine hispida, Cucumis sativus, Fragaria grandiflora, Triticum dicoccum*, and *Phleum pratense*. Leaves were analyzed for 2,4-D, its conjugates and metabolites 1-7 days after application. After 7 days, intact 2,4-D was found in concentrations of 4.1-85%, but no 2,4-D was found in *C. sativus*. The concentration of hydroxylated derivatives was 1.9-87.2%, but no such derivatives were found in *G. hirsutum* and *H. annuus*. The 2,4-D-glucose conjugates accounted for 1.4-24.8% in test plants but were not present in *G. hirsutum*. Conjugates with amino acids accounted for 1.5-48.1%; they were not found in *C. sativus, F. grandiflora, T. dicoccum*, and *Ph. pratense*. Substances not extractable with boiling water accounted for 0.9-30.5%. The long-term persistence of intact and mobile 2,4-D is a prerequisite for physiological activity, i.e., for the manifestation of plant sensitivity, while resistance is due to immobilization or either intact or metabolized 2,4-D. Metabolism does not always lead to detoxification. Conjugates are physiologically active and may release intact 2,4-D. On the other hand, ring hydroxylation or destruction of the side chain (metabolism to 2,4-dichlorophenol) constitutes genuine metabolism. The 2,4-dichlorophenol accounted for 0.5-62.4% on day 7.

76-1944. Mendoza, C. (Dept. Microbiol., Sch. Sci., Univ. Madrid, Spain). **Effectos de cinco insecticidas sobre el crecimiento de *Azotobacter chroococcum* y *Rhizobium trifolii*. [The effects of five insecticides on the growth of *Azotobacter chroococcum* and *Rhizobium trifolii*.]** *An. Inst. Nac. Invest. Agrar. Ser. Gen.* 2: 21-35; 1973. (11 references) (Spanish)

The effects of increasing concentrations of five different pesticides (DDT, sevin (carbaryl), menazon, rogor (dimethoate), and malathion) on nitrogen fixing bacteria was evaluated in cultures of *Azotobacter chroococcum* (Gottingen 1602 strain) (AzC) and *Rhizobium trifolii* (RzT) isolated from roots of *Trifolium repens*. The determinations were made by measuring the optical density of the culture medium at 500 or 600 nm with a spectrocolorimeter at the time of inoculation, then every 24 hr during 15-16 days of incubation at 28°C; the quantity of a bluish-green pigment produced by AzC was measured at 425 nm after filtration through 0.8 μ millipore membrane. DDT and menazon (5000 and 10,000 ppm) inhibited the growth of AzC. Following a period of adaptation, DDT increased the bacterial population at doses higher than 500 ppm and delayed the appearance of the pigment on the second and seventh days. The author theorizes that the increase in bacterial population is due to the production of an enzyme which modifies the molecular structure of DDT. Neither DDT nor menazon (10-1000 ppm) had no effect on the growth of RzT. Sevin, rogor and malathion decreased the bacterial population of AzC at doses higher than 1, 50, and 100 ppm, and that of RzT at 10, 300 and 10 ppm, respectively. Bacteriostasis was achieved at concentrations higher than 300 and 50 ppm of sevin, 1000 and 3000 ppm of rogor, and 500 and 700 ppm of malathion for AzC and RzT respectively.

76-1945. Manyai, S. (Orszagos Munka-Uzemegeszsegugyi Int., Budapest, Hungary). **Toxikus detoxikacio: Az oxidativ deszulfuralas kovetkezmenye. [Detoxification of toxic substances: a consequence of oxidative desulfuration.]** *Munkavedelem* 21(1-3): 45-48; 1975. (13 references) (Hungarian)

Recent studies on the mechanism of detoxication of phosphorothioates and carbon disulfide in the liver are reviewed. The oxidative desulfuration of these compounds in the liver is associated with the attachment of sulfur to the liver microsomes via a covalent bond, which results in increased permeability of the microsomal membrane and reduced cytochrome P-450 levels in the smooth

endoplasmic reticulum. This ultimately leads to a decline of the activity of mixed function oxidases, which play an important role in detoxification. Reduction of the cytochrome P-450 content was observed in microsomes incubated with parathion, phenylthiourea, and naphthylisothiocyanate in the presence of NADPH.

76-1946. Henneberg, M. (Med. Acad., Lodz, Poland). **Studia nad toksykologia i analiza toksykologiczna DNPP (4,6-dwunitro-2- izopropylofenolu) i DNBP (4,6-dwunitro-2-II Rz. butylofenolu) u szczurow. [Studies on toxicity and toxicologic analysis of DNPP and DNBP.]** *Ann. Acad. Med. Lodz.* 14(1): 170-171; 1973. (Polish)

Three new chromatographic and spectrophotometric methods were devised for the determination of DNPP and DNBP in organs and body fluids. In experiments with rats it was found that both compounds can quickly penetrate through intact skin as well as through the alimentary tract; the speed of resorption of DNPP is greater than that of DNBP. Detection and characteristics of complexes formed by these compounds with serum albumins are described. Both compounds are methemoglobin forming agents and can cause coproporphyrinuria and urobilinogenuria. It is suggested (based on the results and histopathological studies of livers during subacute intoxication) that jaundice caused by DNBP and DNPP is of the hemolytic type. After oral intoxication metabolites rather than precursors were detected in organs and urine. The metabolic degradation in the rat proceeds in the direction of a reduction of nitro groups to amine groups.

76-1947. Griffaton, G.; Faudemay, F.; Rozen, R.; Naon, R.; Lowy, R. (Lab. Biol., Conserv. Natl. Arts Metiers, 75141 Paris, Cedex 03, France). **Metabolisme energetique du foie chez des rats recevant un regime contamine par des dithiocarbamates. [Energy metabolism of the rat liver during feeding of a diet contaminated with dithiocarbamates.]** *Ann. Nutr. Aliment.* 29(2): 103-116; 1975. (18 references)

The effects of dithiocarbamates on rats were studied by feeding young male Wistar CF rats a well-balanced diet containing either 275 ppm nabam, 600 ppm thiram, or 3600 ppm zineb over a 14 day period. The thiram group of rats had the smallest body weight and lowest food intake. All pesticide-exposed animals had higher liver weights than was predicted according to their body weights. Pesticide containing diets decreased liver lactate concentrations and the lac/pyr ratio. Thiram was more active, and it partly blocked the glucose induced increase of the cytoplasmic redox potential, as estimated from the variation of the lac/pyr ratio. Pesticide-containing diets also lowered liver concentrations of β-hydroxybutyrate, acetoacetate, and their ratio. The pesticides only slightly modified liver contents of adenine nucleotides and inorganic phosphate in the fasting state, but increased the ATP drop following cold exposure and decreased the net ATP synthesis produced by glucose administration. Thiram was the most active and zineb the least active of the pesticides tested. It was concluded that dietary dithiocarbamates either induced a hyperthyroid status in the animal, or themselves acted as thyroxin-like compounds, as the liver metabolism was more directed towards heat production than towards supplying chemical energy for synthesis.

76-1948. Oe, T.; Hitaka, K.; Matsumoto, M.; Mizutani, T. (Kyoto Munic. Inst. Public Health, Kyoto, Japan). **[Studies on the structure and cumulative properties of organochlorine compounds. Diphenylmethane derivatives.]** *Kyoto-Shi Eisei Kenkyusho Eiken Nenpo (Annu. Rep. Kyoto Munic. Inst. Public Health)* 41: 39-40; 1975. (Japanese)

Experiments were performed to explain the high accumulative tendencies of DDT and DDE as compared to the nonaccumulative tendency of 4,4-dichlorobiphenyl, which has a homologous structure. The relationship between the structure and accumulative properties of these compounds was also studied. Male mice were fed 4,4'-dichlorobiphenyl, diphenyl trichloroethane, diphenyl dichloroethylene, *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDD, *p,p'*-DDE, bis(*p*-chlorophenyl) methane, and *p,p'*-dichlorobenzophenone (30 ppm in daily diet for 20 days ad lib). This was followed by feeding a normal diet. The mice were sacrificed at various times to determine the levels of these compounds. Results revealed that chlorine substitution on the benzene ring and the position of substitution on the saturated carbon chain are determining factors for the cumulation tendency. The decrease in number of atoms by introduction of an unsaturated bond did not affect the cumulative property of the compounds.

76-1949. Lutz-Ostertag, Y. (Lab. Biol. Anim., Univ. de Clermont-Ferrand, Clermont-Ferrand, France). **Etude sur plusieurs generations des effets du lindane sur les taux de fecondation et de mortalite embryonnaire, le pouvoir d'eclosion, la ponte, le poids des oeufs et des poussins. [The effects of lindane over several generations on fertility and embryonic mortality levels, hatchability, egg production, and egg and chick weight.]** *Arch. Anat. Histol. Embryol. Norm. Exp.* 57(2): 269-282; 1974. (36 references) (French)

The effects of lindane sprayed on eggs at three levels (1.5%, 3.0%, and 6.0%) normally used in plant protection were studied in 4 successive generations of quail. Fertility rates decreased from an average of about 83% to 78%, depending on the group of eggs considered. Mortality rates increased when eggs from each generation were treated; while the embryonic mortality rate is 6.06% in controls, that of eggs treated and sacrificed 14 days before incubation was 16.81% at 1.5% of lindane and 20.8% at 3% lindane. The effect is cumulative. Total embryonic mortality in eggs kept till hatching was comparable to that of the previous group. The percentage of hatching was inversely proportional to the total mortality rate. Egg production in quails born of treated eggs or treated parents was always 8-15 days later than that of controls. Hatching rhythm restabilized 4, 6 or 8 weeks later. Egg weight was also

affected; compared to a maximum weight of 15.6 g for controls, treated eggs ranged from 14 g to 11 g in succeeding generations. Chick weights followed the same pattern.

76-1950. Kimmerle, G. (Inst. Toxikol. Bayer AG, Werk Wuppertal, Wuppertal, Germany). **Subchronic inhalation toxicity of azinphos-methyl in rats.** *Arch. Toxicol.* 35(2): 83-89; 1976. (6 references)

Azinphos-methyl was evaluated for its subchronic inhalation toxicity. The exposure of rats to concentrations of 0.195, 1.24, and 4.72 mg/m^3, respectively, for 12 weeks, 6 hr daily, 5 times weekly, resulted in effects only in those animals which inhaled aerosols of the highest concentration. This group showed a significant depression of the cholinesterase activity in plasma and erythrocytes. The males of this group had a lower body weight gain. The results are in agreement with the established maximum allowable concentration of 0.2 mg/m^3.

76-1951. Giurgea, R.; Illyes, S.; Manciulea, S.; Suteu, D.; Wittenberger, C. (Author address not given). **Action of small doses of insecticides on metabolic indices in chickens.** *Arch. Vet.* 10(2): 59-66; 1975. (19 references)

Three-week-old Studler type chickens were maintained for 2-8 weeks on diets containing heptachlor (1 ppm) or fenchlorfos (ronnel, 0.5 or 1 ppm). The ascorbic acid content of the adrenals was significantly modified after 2 weeks in the heptachlor group, after 4 weeks in the 1 ppm fenchlorfos group, and after 6 weeks in the 0.5 ppm fenchlorfos group. The catecholamine content of the blood plasma was reduced after 4 weeks, but was later elevated to slightly greater than control levels in the heptachlor group. There was no correlation between the adrenal ascorbic acid content and the plasma catecholamine level. The diminution in the blood catecholamine concentration was correlated with increased glycogen storage in the liver, however. As compared with the nontreated control group, the body weights of the pesticide-treated chickens were reduced after 6 weeks; the adrenal weights were unchanged. Fenchlorfos at both dosage levels increased the blood cholinesterase activity. It is concluded that changes in various metabolic compartments following pesticide treatment led to a state of stress only in the case of heptachlor, and not in the case of fenchlorfos.

76-1952. Donchev, D.; Petrova, E.; Sheykov, N. (Principal Milit. Med. Inst., Sofia, Bulgaria). **Izmeneniya ul'trastruktury pochek pri ostrom otravlenii antikholinesteraznymi veshchestvami (eksperimental'noe issledovanie). [Changes in the ultrastructure of the kidney in acute poisoning with anticholinesterase substances (experimental study).]** *Arkh. Patol.* 37(12): 53-57; 1975. (5 references) (Russian)

Ultrastructural changes caused by pinacolyl methylphosphonofluoridate (soman) were studied in the kidneys of rabbits following i.m. injection at 30 μg/kg. The morphological changes affected all elements of the nephron and were not specific in nature. The changes were most pronounced in the podocytes and in the epithelium of the canaliculi of the proximal and distal segments of the nephron. The podocytes displayed marked vacuolation of the cytoplasm and separation of the pedicles from the large processes. Destruction of the mitochondria, which may be an explanation for the blockade of oxidative processes in the cells, leading to increased lysosomal activity, was observed in the epithelium of the canaliculi.

76-1953. Almeida, W. F. (Anim. Biol. Div., Biol. Inst. of Sao Paulo, Brazil). **Aspectos toxicologicos dos herbicidas 2,4-D e 2,4,5-T. [Toxicological aspects of the herbicides 2,4-D and 2,4,5-T.]** *Biologico* 40(2): 44-51; 1974. (23 references) (Portuguese)

The salts, esters, and amines of 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) are used as herbicides and are classified as moderately toxic. They can also be indirectly toxic to animals when applied to a pasture, both by making toxic plants more attractive to cattle and by causing normally nontoxic plants to develop dangerous nitrate levels. An impurity, designated as TCDBD (dioxin), present at 0.1 ppm in 2,4,5-T, has teratogenic effects and can cause the death of the fetus or serious congenital defects. The herbicide known as "Agent Orange," which contains 50% 2,4-D and 50% 2,4,5-T and includes high levels of the above mentioned impurity, has been outlawed since 1970 in the USA. A large quantity was recently offered for sale to Brazil and other South American countries, but the National Food Standards Commission of the Brazilian Ministry of Health unanimously counseled against the use of this product in a decision of August 2, 1973. Extensive application of herbicides with a 2,4-D base in the Brazilian State of Sao Paulo has caused environmental contamination injurious to cotton, beans, tomato, and papaya crops. The herbicide 2,4,5-T has been used in Brazil for "clearing pasture land." Aerial application requires the airplanes to fly at an altitude of 40 meters to avoid collision with trees and stumps, which violates accepted norms. Application at an altitude of more than 3-5 meters poses a high risk to sensitive crops in the vicinity. Legal restrictions on the use of these herbicides have been imposed in the United States, Canada, Sweden and West Germany.

76-1954. Smejtek, P.; Hsu, K.; Perman, W. H. (Environ. Sci. Program, Physics Dep., Portland State Univ., Portland, OR 97207). **Electrical conductivity in lipid bilayer membranes induced by pentachlorophenol.** *Biophys. J.* 16(4): 319-336; 1976. (36 references)

Electrical conductivity induced in thin lipid bilayer membranes by pentachlorophenol was studied. The membranes were formed from phosphatidyl choline, phosphatidyl ethanolamine, or phosphatidyl glycerol and various amounts of cholesterol. The position and magnitude of

the maximum of the conductivity vs. pH curve depended on the type of lipids and the cholesterol content. At low pentachlorophenol was quadratic and became linear at higher pH. Above 10^{-5} *M* pentachlorophenol, the concentration dependence of the membrane conductivity tended to saturate. The presence of pentachlorophenol enhanced the membrane transport of nonactin-K^+ complex, and increasing the cholesterol content increased the pentachlorophenol-induced conductivity in all membranes and shifted the conductivity toward lower pH. For phosphatidyl choline the largest rate of change of membrane conductivity with cholesterol occurred at a 1:1 phospholipid to cholesterol molar ratio. Pentachlorophenol is a class II uncoupler and the experimental results are consistent with the hypothesis that the membrane permeable species are dimers formed by a combination of neutral and dissociated pentachlorophenol molecules. Several schemes of membrane conduction were considered and arguments are provided in favor of the formation of dimers within the membrane surface.

76-1955. Eto, M.; Miyamoto, H.; Hashimoto, Y. (Dept. Agr. Chem., Kyushu Univ., Fukuoka, Japan). **Quinol phosphate as a metabolite of triphen l phosphate.** *Bochu-Kagaku* 40(3): 106-109; 1975. (18 re'erences)

This paper deals with the metabolic ring-hydroxylation of triphenyl phosphate (TPP) in houseflies to give a quinol phosphate. A total of 530 mg TPP was applied to about 27,000 houseflies. Metabolites were extracted after 24 hours. *In vivo* transformation of TPP into diphenyl *p*-hydroxyphenyl phosphate was confirmed. Diphenyl *p*-hydroxyphenyl phosphate was less active as an antiesterase agent than the TPP, which is itself only a poor inhibitor of esterases. The synergism of malathion by TPP appears to result from other mechanisms than carboxyesterase inhibition.

76-1956. Fogg, G. E. (Marine Sci. Lab., Univ. Coll. North Wales, Menai Bridge, Anglesey, England). **Nitrogen fixation.** *Botanical Monographs* 10:560-582; 1974. (147 references)

Nitrogen fixation in the field is influenced by various factors including light, mineral nutrition, salinity, and temperature. Herbicides such as 2,4-dichlorophenoxyacetic acid (2,4-D) and 2-methyl-4-chloro- phenoxyacetic acid (MCPA) have been reported to inhibit nitrogen fixation by *Nostoc punctiforme*, *N. muscorum*, and *Cylindrospermum* sp. when applied at concentrations used in weed-killing (about 0.1 *M*). Nitrogen fixation, however, was stimulated at 0.1 and 0.01 m*M* concentrations.

76-1957. Seawright, A. A.; Hrdlicka, J.; DeMatteis, F. (Vet. Sch., Univ. Queensland, Brisbane, Australia). **The hepatotoxicity of *O,O*-diethyl, *O*-phenyl phosphorothionate (SV_1) for the rat.** *Br. J. Exp. Pathol.* 57(1): 16-22; 1976. (24 references)

Male Wistar rats were given two ip injections of the sodium salt of phenobarbitone (80 mg/kg) at 24-hr intervals. Twenty-four hr after the second injection, the animals were given ip injections of carbon disulfide (5-20 μg), 100-400 mg/kg SV (*O,O*-diethyl-*O*-*m*- trifluoromethylphenyl phosphorothionate, a parathion analog), CF_3 (400 mg/kg), or carbon tetrachloride (0.5 mg/kg). At 400 mg/kg, SV_1 was hepatotoxic, producing within 24 hr a periacinar hydropic degeneration identical to that caused by CS_2. Both lesions were characterized by a marked depression of hepatic microsomal cytochrome P-450 levels with unchanged concentrations of sodium, potassium, or calcium ions. Carbon tetrachloride, on the other hand, markedly increased the sodium and calcium ion levels while decreasing that of potassium ion. A similar mechanism is suggested for the lesions caused by SV_1 and CS_1. A reactive form of sulfur released from the metabolism of CS_2 and phosphorothionates in the liver may become covalently bound to constituents of the endoplasmic reticulum of the liver cell and, in this way, initiate the toxic liver changes. Drugs and chemicals which contain P=S or C=S bonds and which undergo oxidative desulfuration in the liver could therefore be similarly hepatotoxic.

76-1958. Holland, P.; Parkes, D. C. (Min. Def., Med. Div., Chem. Defence Establishment, Porton Down, Salisbury, Wiltshire, England). **Plasma concentrations of the oxime pralidoxime mesylate (P2S) after repeated oral and intramuscular administration.** *Br. J. Ind. Med.* 33(1): 43-46; 1976. (15 references)

Twenty-eight healthy male volunteers aged 18-26 yr were given one, two, or three im injections of pralidoxime mesylate (P2S); repeat injections were given at 20 min intervals. Forty-nine other volunteers were given four oral doses of P2S (4.0 g each) at 6 hr intervals followed by one, two, or three im injections (500 mg). Mean peak P2S plasma levels were obtained 10 min after a single im injection (7.9 μg/ml), 30 min after two injections (13.9 μg/ml), and 50 min after three injections (18.4 μg/ml). In subjects pretreated orally with P2S, one, two, and three im injections produced mean peak plasma levels of 15.4, 15.6, and 23.9 μg/ml, respectively, 10 min after the final injection. Im injections produced no clinical side effects, but when this procedure was superimposed on the oral regimen, up to 60% of the subjects complained of visual side effects. These side effects may be caused by an accumulation of P2S in the eye during prolonged oral administration and they might prove a hazard in cases of mild anticholinesterase poisoning.

76-1959. Guilhon, J.; Jolivet, G.; Marchand, A. (Lab. Parasitol., Ecole Nat. Vet., Alfort, France). **Considerations sur l'emploi des organo-phosphores dans le traitement interne de la demodexose canine. [The use of organophosphates in the internal treatment of canine demodicidosis.]** *Bull. Acad. Vet. France* 48(4-5): 243-251; 1975. (15 references) (French)

Six dogs (of various ages and breeds and both sexes) with dry demodicidosis received 30 mg/kg dichlorvos, 3 times, at 15 day intervals, in the form of polyvinyl chloride granules with 19% active substance; hexomedine was applied to prevent bacterial complications. Microscopic examinations at least 5 weeks after endotherapy revealed numerous live *Demodex canis* and the dogs displayed no improvement. One dog (collie) had cutaneous reactions (papular eruptions, dermal edema). In a further study, a seborrheic beagle with generalized demodicidosis received 35 mg/kg dichlorvos according to the above scheme. A basset served as a control. The dogs were kept in the same place and fed together. The number of parasites decreased progressively in both animals, while the lesions remained fairly stable. Treatment was well tolerated.

76-1960. Owen, P. J.; Wells, M. R. (Dep. Biol., Middle Tennessee State Univ., Murfreesboro, TN 37132). **Insecticide residues in two turtle species following treatment with DDT.** *Bull. Environ. Contam. Toxicol.* 15(4): 406-411; 1976. (10 references)

Eighteen red-eared (*Chrysemys scripta*) and 17 midland painted (*Chrysemys picta*) turtles were treated with DDT (100 mg/kg, given orally 1-3 times at weekly intervals) in corn oil. Pesticide residues in various tissues were determined by electron capture gas chromatography. *p,p'*-DDE was found in all tissues (brain, liver, and fat) of *Chrysemys scripta*, all metabolites of DDT were detected in the liver, and relatively high concentrations of all metabolites were detected in the brain. Residues of all metabolites were also detected in all tissues in animals treated for 3 weeks with DDT, and all metabolites were detected in the excrement. Residual *p,p'*-DDT was detected in the liver of one specimen of *Chrysemys picta*, but was not detected in the brain, fat, or excrement. Clearance of *p,p'*-DDT and *p,p'*-DDD (TDE) from the liver was accomplished within 24 hr after treatment, while the excrement contained *p,p'*-DDT and *p,p'*-DDD throughout the assay period. It is concluded that the concentrations of DDT previously used in the environment would not pose a health problem for turtles.

76-1961. Yoshida, T.; Nomura, M.; Suzuki, Y.; Uchiyama, M. (Pharmaceutical Inst., Tohoku Univ., Aobayama, Sendai, Japan). **Inhibition of hepatic UDP-glucuronyltransferase activity by organophosphate insecticides and by carbon disulfide in mice.** *Bull. Environ. Contam. Toxicol.* 15(4): 421-424; 1976. (16 references)

Various organophosphate insecticides (fenitrothion, parathion, methyl parathion, diazinon, DDVP) and carbon disulfide dissolved in corn oil were given i.p. in varying dosages to male ddY mice. UDP-glucuronyl transferase was depressed shortly after the administration of fenitrothion at 100 mg/kg, but returned to near control values within 12 hr; the maximum inhibition was observed after 4 hr. Carbon disulfide caused a similar inhibition of UDP-glucuronyl transferase. The effect of fenitrothion was dose-dependent. With the exception of DDVP (dichlorvos), the other organophosphate insecticides also inhibited enzyme activity. The insecticide-induced inhibition of UDP-glucuronyl transferase was less than that observed with drug-metabolizing enzyme activity. The inhibition of UDP-glucuronyl transferase by organophosphate insecticides containing the P=S group may occur according to a mechanism similar to that for drug-metabolizing enzymes.

76-1962. Murakami, M.; Fukami, J. I. (Rikagaku Kenkyusho, Wako-shi, Saitama, Japan). **Uptake and persistence of pesticides in cultured human cells.** *Bull. Environ. Contam. Toxicol.* 15(4): 425-428; 1976. (4 references)

Confluent cultures of human embryonic lung diploid cells (HEL 299) were treated with radioactive pesticides (0.02 μM of DDT, aldrin, dieldrin, parathion, or chlordimeform) in ethanol. After 24 hr, the contaminated medium was replaced with fresh medium containing no pesticide, and cultivation was continued for 9-10 days. At first, DDT, aldrin, and dieldrin were incorporated into the cells at a rate 20-70 times greater than that of chlordimeform and parathion. During incubation, the amounts of all pesticides taken up by the cells decreased with time, while maintaining the initial proportion. Based on their cellular uptake, the test compounds clearly fall into two groups: DDT, aldrin, and dieldrin, which are generally classified as persistent pesticides; and chlordimeform and parathion, which are classified as nonpersistent insecticides.

76-1963. Brown, J. R.; Chow, L. Y.; Deng, C. B. (Inst. Environ. Studies, Univ. Toronto, Toronto, Ontario, Canada). **The effect of Dursban upon fresh water phytoplankton.** *Bull. Environ. Contam. Toxicol.* 15(4): 437-441; 1976. (4 references)

The phytoplankton population of a large natural pond near the Canadian shore of Lake Huron was determined, after which polyethylene test cylinders were placed randomly throughout the pond. Analytical grade Dursban (chlorpyrifos) was added to four of the five cylinders at concentrations of 1.2, 2.4, 24, and 240 ppb. Phytoplankton and diatoms in the cylinders were enumerated before and 2-17 days after treatment. Dursban concentrations in the water were determined by electron capture gas chromatography. At 1.2 ppb, Dursban inhibited the growth of *Ankistrodesmus falcatus*, *Ankistrodesmus spiralis*, *Dinobryon sp.*, *Glenodinium sp.*, *Gonatozygon sp.*, *Scenedesmus dimorphus*, *Tetraedron sp.*, *Trachelomonas sp.*, and *Diatoms*. *Ceratium sp.* was not influenced even at 240 ppb, however. Although there was a rapid decline in the concentration of Dursban within the test cylinders, the effect upon phytoplankton was still evident 17 days after treatment. Thus, Dursban in very low concentrations has a prolonged effect on fresh water phytoplankton, the effect being greatest during the organisms' active growth phase.

76-1964. Krause, W.; Hamm, K.; Weissmuller, J. (Zentr. Dermatol. Androl. Venerol., Justus Liebig-Univ., Giessen, Germany). **Damage to spermatogenesis in juvenile rat treated with DDVP and malathion.** *Bull. Environ. Contam. Toxicol.* 15(4): 458-462; 1976. (9 references)

Eighty male Wistar rats were treated with olive oil, 20 mg/kg DDVP (dichlorvos) on the fourth and fifth days of life, 10 mg/kg DDVP daily from the fourth through the twenty-third day of life, 40 mg/kg malathion on the fourth and fifth days of life, or 20 mg/kg malathion on the fourth through the twenty-third day of life. The treatments produced no significant changes in body or testicular weight or the ratio of tubulus to interstitial tissue in the testes. However, the number of Sertoli cells per tubulus cross section, the number of A-spermatogonia per tubulus cross section, the number of pachytene spermatocytes per tubulus cross section, the number of spermatids per tubulus cross section, and the number of Leydig cells per mm^2 of testis section were reduced by DDVP and malathion treatment. The greatest change was seen following the administration of malathion at 40 mg/kg. All parameters returned to normal by the fiftieth day of life. Damage to the spermatogenic cells was probably secondary to a reduction in testosterone synthesis.

76-1965. Hoben, H. J.; Ching, S. A.; Casarett, L. J. (Dep. Pharmacol., Univ. Hawaii, Honolulu, HI 96816). **A study of inhalation of pentachlorophenol by rats. III. Inhalation toxicity study.** *Bull. Environ. Contam. Toxicol.* 15(4): 463-465; 1976. (3 references)

Seven groups of 12 male Sprague-Dawley rats were exposed for 28-44 min to a sodium pentachlorophenate (PCP) aerosol at a dosage of 10-14.5 mg/kg PCP. The amount of aerosolized PCP inhaled was based on the assumption that one rat inhaled air at 80 ml/min. The LD50 for inhaled PCP aerosol was 11.7 mg/kg, which is much lower than the 210.6 mg/kg LD50 for ingested PCP and the 34 mg/kg LD50 for i.p. PCP.

76-1966. Hoben, H. J.; Ching, S. A.; Casarett, L. J. (Dep. Pharmacol., Univ. Hawaii, Honolulu, HI 96816). **A study of inhalation of pentachlorophenol by rats. IV. Distribution and excretion of inhaled pentachlorophenol.** *Bull. Environ. Contam. Toxicol.* 15(4): 466-474; 1976. (12 references)

Groups of 10-12 male Sprague-Dawley rats were exposed to sodium pentachlorophenate (PCP) aerosol during 1-5 daily 20-min periods. The calculated dose at each exposure was 1.04-5.7 mg/kg. The results indicated that repeated respiratory exposures to PCP in the rat do not result in an increased body burden of this compound, as would be expected from the 24-hr half-life determination from a single inhalation exposure. The data suggest some mechanism induced by prior exposure to PCP that increases the ability of the animals to remove this compound from their bodies. Increased excretion may be a factor in this activity, but it cannot account for the total effect. Storage appears unlikely, in that the elimination rate and time period remained unchanged after five doses as compared with one. Increased metabolism may be the explanation, although such a mechanism can only be inferred from these data. Quantitative metabolic results will be necessary to support this hypothesis.

76-1967. Rashad, M. N.; Mi, M. P.; Klemmer, H. W.; Budy, A. M.; Reichert, E. L. (Dep. Genet., Univ. Hawaii, Honolulu, HI). **Association between serum cholesterol and serum organochlorine residues.** *Bull. Environ. Contam. Toxicol.* 15(4): 475-477; 1976. (2 references)

Serum cholesterol was measured in 9,885 individuals attending the appraisal center at the Pacific Health Research Institute during the period July 1969 to December 1970, and serum organochlorine residues were measured in 3,568 subjects. The subjects were also given a physical examination, and their medical, dietary, and pesticide exposure history was taken. After adjusting for age, sex, and race effects, serum cholesterol values were significantly associated with serum *p,p'*-DDT and *p,p'*-DDE values. The association between *p,p'*-DDT and cholesterol was highly significant, but, in regression analysis, this significance was suppressed by a secondary interaction with *p,p'*-DDE. The association with *p,p'*-DDE remained significant. The data suggests that *p,p'*-DDE may stimulate the synthesis of cholesterol in the liver, leading to an elevated serum cholesterol.

76-1968. Ramade, F.; Roffi, J. (Lab. Zool. Endocrinol., Univ. Paris-Sud, Orsay, France). **Action de deux insecticides, le Lindane et le DDVP (Dichlorvos) sur les surrenales de la Souris. [Effects of two insecticides, lindane and DDVP (dichlorvos), on mouse adrenals.]** *C.R. Hebd. Seances Acad. Sci. Ser. D.* 282: 1067-1070; 1976. (11 references) (French)

The intraperitoneal injection of 1.8 mg lindane in female mice did not cause death. However, there were significant pathological adrenal alterations; the weight of the glands increased by 18.6% compared to controls. Epinephrine and norepinephrine levels were not modified. Intraperitoneal injections of 0.3, 0.75, 1.125, and 1.5 mg DDVP (dichlorvos) in female mice produced, respectively, 0, 7, 81, and 86% mortality after 11 days. The lowest dose did not significantly modify adrenal weight. The other doses, however, produced 21% (0.75 mg) and 43% (1.125 mg) increases. There was a net decrease in epinephrine and norepinephrine production even at 0.3 mg DDVP. The increase in adrenal weight is probably due to stimulation of the gland by the pituitary gland ensuing from the neurotropic action of the insecticides.

76-1969. David, D. (Lab. Biol. Anim., Univ. Clermont, Aubiere, France). **Effets compares d'injections intravitellines de *p,p'*-DDT et de DDT commercial sur la population germinale des gonades embryonnaires d'Oiseau. [Com-**

parative effects of i.v. injections of *p,p'*-DDT and commercial DDT on the germ cell population of embryonic bird gonads.] *C.R. Hebd. Seanc. Acd. Sci. Ser. D.* 282: 1125-1128; 1976. (4 references) (French)

In quail eggs, intravitelline injection of *p,p'*-DDT (2.5 or 5 mg) and commercial DDT (double the quantities) produced equal reductions in the gonadal germ cell population. With the pure pesticide, the reduction was equivalent for both concentrations, while with the commercial product the higher dose was more inhibitory. The magnitude of this sterilizing effect was comparable to that obtained following immersion of the eggs in an aqueous suspension of commercial DDT. These results show that in immersion experiments only the organochlorine compound is responsible for the sterilizing effect, and in the case of commercial DDT, it is the *p,p'*-DDT present (50% active substance) which acts on the germ cells. In hens' eggs, despite injection of high doses of pure or commercial DDT into the vitellus, the sterilizing action was much less pronounced than after external application of the pesticide to the shell. The slighter effect obtained by injection would be related to the frequency of excentric germ cells, which are more numerous in the chicken than in the quail. The injected solution always rises to the highest point of the vitelline circle; thus the embryo would only develop in contact with the solvent when the embryos are perfectly centered.

76-1970. Hallett, D. J.; Greenhalgh, R.; Weinberger, P.; Prasad, R. (Dept. Biol., Univ. Ottawa, Ottawa, Ontario, Canada K1N 6N5). **The absorption of fenitrothion during germination of stratified and nonstratified white pine seeds and identification of metabolites formed.** *Can. J. For. Res.* 5(1): 84-89; 1975. (9 references)

Identification and quantitative evaluation of fenitrothion and its metabolic products were made during the germination and early seedling growth of white pine, *Pinus strobus* seeds. The white pine seeds were treated with a 0.15 m*M* solution of fenitrothion. Absorption and accumulation of fenitrothion and accumulation of fenitrooxon and *S*-methyl fenitrothion were demonstrated in the endosperm and embryos of germinated seeds and seedlings. Neither the parent compound nor its metabolites adversely affected the later development of the pine seedlings. The results of this study strongly indicate that fenitrothion in an aqueous solution is absorbed through the seed coat of *P. strobus* seeds and transported through the endosperm to the embryo. During stages of early seed morphogenesis, fenitrothion accumulated preferentially in seeds preconditioned by stratification. Fenitrothion transport and the metabolism of fenitrothion to the oxon form and the *S*-methyl isomer in the endosperm and embryo of *P. strobus* seeds have been previously reported.

76-1971. Ecobichon, D. J. (Dep. Pharmacol., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Species differences in the reactivation of organophosphate-inhibited plasma esterases by diacetylmonoxime.** *Can. J. Physiol. Pharmacol.* 54(2): 86-92; 1976. (13 references)

A study was conducted to assess whether the protection afforded to organophosphate-poisoned animals by diacetylmonoxime (DAM) was correlated with the reactivation of non-essential aliesterases (AliE). *In vitro*, the DAM-catalyzed reactivation of plasma AliE and cholinesterases (ψ ChE) of rat, rabbit and guinea pig inhibited by 0.01 m*M* diisopropyl phosphorofluoridate (DFP) and *O,O*-dimethyl- 2,2-dichlorovinyl phosphate (dichlorvos, DDVP) was investigated. Marked reactivation of the rat plasma enzymes was achieved with 10 m*M* DAM. Higher concentrations (30 m*M*) were necessary for the slow reactivation of rabbit and guinea pig plasma AliE. Reactivation of the ψ ChE of those species was comparatively slow. Reactivation of DDVP-inhibited esterases proceeded in all species at a more rapid rate than those inhibited by DFP. The dependence of ψ ChE reactivation upon concomitant more rapid reactivation of AliE by DAM was demonstrated using Sephadex fractionated AliE and ψ ChE but a marked effect was observed only with the rat, suggesting that the plasma AliE of this species is functionally different. The *in vitro* observations were confirmed by *in vivo* studies in rats and rabbits. DAM (50 or 150 mg/kg), administered to atropinized rats 15 min before a lethal dose of DFP, protected the animals. Few severe toxic signs were observed and reactivation of both plasma AliE and ψ ChE occurred. In contrast, DAM protected the rabbit against a lethal dose of DFP but only reactivation of the erythrocyte acetylcholinesterase was observed. (Author abstract by permission)

76-1972. Patocka, J.; Bajgar, J. (Milit. Med. Inst., Hradec Kralove, Czechoslovakia). **Rychlost starnuti acetylcholinesterazy a butyrylcholinesterazy inhibovane *O*-isopropyl- *S*-(2-diisopropylaminoethyl)- methylthiofosfonatem. {Rate of aging of acetylcholinesterase inhibited by *O*-isopropyl-*S*- (2-diisopropylaminoethyl) methylthiophosphonate.}** *Cesk. Farm.* 23(1): 25-27; 1974. (23 references) (Czech)

O-Isopropyl-*S*-(2-diisopropylaminoethyl)-methylthiophosphonate (IDIMP) is highly toxic and a strong cholinesterase inhibitor. The *O*-isopropyl- methylphosphonylated enzyme which forms initially can be dissociated by oximes, reactivating the enzyme, but gradually undergoes spontaneous conversion to the aged form, which cannot be reactivated. Isopropanol is split off in the process. The aging half-life of *O*-isopropyl- methylphosphonylated acetylcholinesterase (pH 8.0) is 19.1 + 0.9 hr at 20° and 6.4 + 0.2 hr at 37°. The corresponding activation energy is 10.97 kcal/mole. The following aging half-lives were found for *O*-isopropylphosphonylated butyrylcholinesterase (pH 8.0): 26.5 + 1.6 hr at 20°C and 11.9 + 0.5 hr at 37°. The activation energy is 8.44 kcal/mole. (From author abstract)

76-1973. Groch, L.; Svobodova, Z. (Nat. Inst. Vet. Med., Brno, Czechoslovakia). **Histopathologicke zmeny u ryb intoxikaci organofosforecnymi pesticidy. [Histopathological changes in fish poisoned with organophos-**

phate pesticides.] *Cesk. Hyg.* 19(1): 442-444; 1974. (2 references) (Czech)

Changes were found in the anatomy and physiology of young carp after administration of organophosphorus pesticides. The fish were exposed to Metathion E-50 (active ingredient content 43% fenitrothion) at 0.0096 ml/l, Brevinyl E-50 (active ingredient content 50% dichlorvos) at 0.051 mg/l or Decemtion P-6 (active ingredient content 6% phosmet) at 191 mg/l aquarium water for 48 hr. Intoxication in the first two cases was manifested by massive vasodilation with venostasis in the gills and impairment of circulation in the respiratory apparatus. Less severe changes were found in the heart, liver, and pancreas. Marked dystrophic changes, especially vacuolation, were observed in the hepatocytes after intoxication with Decemtion P-6.

76-1974. Gencik, A. (Research Institute of Hygiene, Bratislava, Czechoslovakia). **Chemicke mutageny v zivotnim prostredi cloveka. [Chemical mutagens in the human environment.]** *Cesk. Hyg.* 19(9): 419-425; 1974. (17 references) (Slovak)

The effects of strong and weak mutagenic agents on human genetic material and on the environment were discussed. Certain antibiotics, fungicides, herbicides, insecticides, and chemosterilants have been pointed out as possible mutagenic agents. The above mutagenic agents brought about a decline in the selection pressure against mutations and a depression of antimutagenic activities. In addition, it was noted that these agents can bring about changes in the genetic information containing prezygotic matter, causing mutated genotypes. Also, mutagenic damage, chromosomal abnormalities in the germ cells and somatic cells, and changes in the native stability of the genes were reported. The effects, however, go beyond those in humans. Research has indicated the possibility that exposure to pesticides will produce a mutant strain of insects resistant to them and posing a danger to plant and human life. It was concluded that the disruption of the balance maintained between increases and decreases in pathological genes by the counterselection process could lead to an increase in mutations.

76-1975. Krampl, V. (Nat. Inst. Hyg., Bratislava, Czechoslovakia). **Vyzvam interakcii chlororganickych insekticidov s liecivami a inymi zluceninami pri hodnoteni pesticidov v zivotnom prostredi. [Importance of organochlorine insecticide interactions with drugs and other compounds in relation to the effect of pesticides on the environment.]** *Cesk. Hyg.* 20(3): 3 151-157; 1975. (54 references) (Czech)

Many biological interactions of chlorinated insecticides with drugs, with other pesticides, and with some natural substrates are now known. Most if not all of these effects are the result of hepatic enzyme stimulation. Insecticides such as chlordane, aldrin, dieldrin, BHC, and heptachlor increase the growth of the liver and increase the activity of hepatic microsomal enzymes. Chlordane increases the metabolism of barbiturates. The stimulating effect of chlorinated insecticides on drug metabolism can markedly affect the acute toxicity and other effects of the drugs. The effect of chlorinated insecticides on the metabolism of a drug can last for several weeks after exposure to the insecticide has ended, because of the accumulation of these compounds in the tissues. It was shown that as little as 10 μg of DDT in the adipose tissue of a rat was sufficient to shorten markedly the sleep induced by pentobarbital. Chlorinated insecticides such as DDT react with other chlorinated insecticides. For example, DDT was shown to stimulate the metabolism of dieldrin in rates. Other types of agrochemicals are also metabolized by hepatic microsomal enzymes (organophosphorus insecticides) and therefore it is probable that they react with the chlorinated insecticides. Many organophosphosphates require microsomal oxidation to an active toxic form. Therefore increased activity of microsomal enzymes may result in protection or increased toxicity, depending on which oxidation process, degradation or activation, is predominant.

76-1976. Senser, F. (Deutsche Forschungsanst. Lebensmittelchem., Munich, Germany). **Untersuchungen ueber die Abbau von Herbiziden (Linuron, C_9 H_{10} Cl_2 N_2 O_2) durch die Mikroflora von Erntegueteern (Lebensmittel pflanzlicher Herkunft). [Investigations on the decomposition of herbicides (linuron) by the microflora of some crops (food of vegetable origin).]** *Chem. Mikrobiol. Technol. Lebensm.* 4(1): 20-44; 1975. (4 references) (German)

Microorganisms (*Pseudomonadaceae, Erwinia, Lactobacteriaceae, Fungi imperfecti, Micrococcaceae, Bacillaceae*), isolated from foods of vegetable origin (potatoes, carrots, celery, lettuce, cucumbers, spinach, onions, asparagus, and strawberries) were tested for their ability to degrade linuron. Some 15% of the 551 species isolated were found to be able to partly degrade linuron. These species were *Pseudomonas* sp., *Erwinia carotovora, Erwinia* sp., *Penicillium* sp., *Aspergillus* sp., *Fusarium* sp., *Verticillium* sp., and *Bacillus* sp. Many microorganisms demethylated linuron, while others degraded it by demethoxylation to 3,4-dichloroaniline with *N*-(3,4-dichlorophenyl)urea as an intermediate product. Compared with these microorganisms, soil microorganisms metabolize linuron more readily.

76-1977. Engelhardt, G.; Wallnoefer, P. (Bayer. Landesanst. Bodenkult. Pflanzenbau, Abt. Pflanzenschutz, Munich, Germany). **Effect of 2-methyl- and 2-halogen-substitution on the rate of hydrolysis of benzanilide fungicides by *Bacillus sphaericus*.** *Chemosphere* 5(2): 91-94; 1976. (14 references)

The effect of methyl and halogen substitution on the velocity of benzanilide hydrolysis by growing cultures of *Bacillus sphaericus* and by a crude preparation of the aryl acylamidase derived from it was studied. All of the

compounds tested (benzanilide, 2-halogenated benzanilides, and 2-methylbenzanilide) were hydrolyzed by whole cells and by the crude aryl acylamidase preparation with the formation of aniline and the corresponding benzoic acid. Benzoic acid and 2-fluorobenzoic acid were hydrolyzed at about the same rate, whereas hydrolysis was considerably reduced by chloro-, bromo-, iodo-, and methyl substitution. The decreased rate of hydrolysis may be attributable to inductive and mesomeric effects of the substituents in addition to steric hindrance.

76-1978. Steinwandter, H. (Hessische Landwirtschaftl. Versuchsanst., D-6100 Darmstadt, Germany). **Zum Lindanmetabolismus an Pflanzen. I. Bildung von Hexachlorbenzol. [Metabolism of lindane in plants. Part I. Formation of hexachlorobenzene.]** *Chemosphere* 5(2): 119-125; 1976. (14 references) (German)

The possible metabolism of lindane to HCB was studied in cut grass treated with lindane-containing water to reach an initial lindane content of 2.5 ppm. The analyses were carried out by gas chromatography, mass spectrometry, and selective separation on alumina. The HCB concentration measured in untreated grass (background value) several weeks after the start of the experiment was 0.013 ppm, compared to 0.043 ppm in lindane-treated samples. The difference, 0.030 ppm, must have been due to the metabolism of lindane to HCB. The findings offer an explanation for the ubiquitous presence of fairly high HCB residue levels despite limited use of this compound. Metabolism of lindane to HCB was not observed in living plants.

76-1979. Korte, I.; Ismail, R. M.; Hockwin, O.; Klein, W. (Inst. Exp. Ophthalmol., Univ. Bonn, Bonn, Germany). **Beitraege zur oekologischen Chemie CXX. Studies on the influences of some environmental chemicals and their metabolites on the content of free adenine nucleotides, intermediates of glycolysis, and on the activities of certain enzymes of bovine lenses in vitro.** *Chemosphere* 5(2): 131-136; 1976. (10 references)

The effect of several organochlorine compounds on the metabolism of incubated bovine lenses was studied. 3-Chlorophenol and 4-chlorophenol increased the content of AMP while reducing that of ATP and fructose; 4-chlorophenol also reduced the contents of glucose and G-6-P. 2,6-Dichloro- 4-nitro-phenol decreased the concentrations of ATP, ADP, and AMP, and water uptake from the medium was increased by trichlorophenol. 2,6-Dichloro- 4-nitroaniline reduced the ATP and glucose content but had no effect on AMP. At 0.1 m*M*, but not at 1 m*M*, monolinuron reduced the glucose concentration. 3,4-Dichlorophenol reduced the ATP and ADP concentrations while increasing that of AMP, and 2,4,5-trichlorophenol reduced the ATP, ADP, G-6-P, and fructose concentrations while increasing that of glucose; both compounds increased swelling of the lens due to water uptake. The organochlorine compounds had little effect on enzyme activities. It is concluded that carbohydrate breakdown in the bovine lenses was impaired by the compounds tested, whereas protein metabolism was little affected.

76-1980. Prestel, D.; Weisgerber, I.; Klein, W.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen- Umweltforsch. mbH, Munich, Germany). **Beitraege zur oekologischen Chemie CXXI. Bilanz der Verteilung und Umwandlung von Metribuzin ^{14}C (Sencor) in Kartoffeln, Moehren und Boden unter Freilandbedingungen. [Contributions to environmental chemistry, Part 121. Distribution and metabolism of ^{14}C-metribuzin (Sencor) in potatoes, carrots and in the soil under field conditions.]** *Chemosphere* 5(2): 137-144; 1976. (12 references) (German)

The metabolism and distribution of 14 C-labeled metribuzin (Sencor) in tomato and carrot plants and in soil were studied. Metribuzin was applied to the soil during two subsequent years at a rate corresponding to 1 kg/kg (potato plants), after which carrots were grown in the third year without the use of metribuzin. Potato plant and soil extracts contained the known metabolites DA, DK and DADK, and a hydrophilic fraction contained DADK along with unknown substances, even after the first vegetation period. Another hydrophilic fraction, isolated from aerial plant parts after the second and third vegetation periods, contained a metabolite that was tentatively identified as the semicarbazone of trimethylpyroracemic acid. The radioactivity of percolating water increased progressively during the entire experiment. After three vegetation periods, 42% of the radioactivity input were found in the soil, 4% were removed with crops, 2% were leached out, and 52% were lost due to evaporation of metribuzin and/or its volatile metabolites. The findings indicate that metribuzin is metabolized in plants and soil via DA and DK to DADK as a more stable intermediary, which is bound in conjugates or to cell components. Another metabolite may be formed from DADK through hydrolytic ring opening.

76-1981. Ismail, R.; Hockwin, O.; Korte, F.; Klein, W. (Inst. Exp. Ophthalmol., Univ. Bonn, Bonn, Germany). **Beitraege zur oekologischen Chemie CXXII. Environmental chemical permeation of bovine ocular lens capsule.** *Chemosphere* 5(2): 145-150; 1976. (13 references)

The permeability of isolated bovine lens capsules for different environmental chemicals and their possible metabolites was determined, as were the effects of these substances on enzyme activities. Monochlorinated anilines, phenols, and trichloroethylene permeated the isolated lens capsules rapidly, reaching a point of equilibrium with the starting solution within 24 hr. Nonpolar mono- and dichloro-aromatic compounds, such as chlorobenzene and dichlorobiphenyl, permeated the capsules very slowly. No permeation occurred with the polychlorinated compounds, such as hexachlorobenzene and aldrin. Increased halogenation and the absence of hydrophilic groups decreased the rate of penetration of the aromatic

compounds. Aldolase and malate dehydrogenase activities were reduced by all compounds tested, glucose-6-phosphate dehydrogenase activity was altered by the mono- and dichlorinated anilines, and glutamate-pyruvate transaminase (GPT) activity was increased by phenols and reduced by monolinuron. The results suggest that monochlorinated anilines and phenols and chlorinated aliphatics are toxic to the lens, whereas hexachlorobenzene and aldrin are not directly toxic.

76-1982. Rhodes, M. L. **Hypoxic protection of paraquat poisoning: a model for respiratory distress syndrome.** *Chest* 66(3): 341-342; 1974.

A study was made to determine whether a hypoxic environment delayed or reduced death from paraquat poisoning. In the initial series, 18 mice were given 27 mg/kg paraquat, i.p. Nine of these 18 were placed in a 10% oxygen environment and the rest were kept in room air. After 5 days, three of the hypoxic group and 6 of the controls had died. A second study using the same dose and a third using an LD50 dose were performed. Deaths in the hypoxic exposed animals were significantly reduced. It is suggested that this finding may offer a therapeutic approach in cases of paraquat poisoning. The results of this study concur with previous findings that the formation of hyaline membrane in cervical vagotomized rabbits was prevented by oxygen exposure and that a 15% oxygen environment reduced respiratory distress in premature infants.

76-1983. Gak, J. C.; Graillot, C.; Ferrando, R.; Truhaut, R. (Cent. Rech. Toxicol., Fac. Sci. Pharm. Biol., Univ. Rene Descartes, Paris, France). **Action de la vitamine A sur l'amplitude de l'induction enzymatique. [Effects of vitamin A on the amplitude of enzyme induction.]** *Med. Chir. Dig. Suppl.* 2: 53-55; 1975. (19 references) (French)

Seventy-two male Wistar rats, newly born to mothers receiving small amounts of retinol, were immediately fed a vitamin A-deficient diet for 10 days. They were then divided into 6 groups and were fed the following diets for 31 days: no DDT or vitamin A; 2: 5 mg DDT, no vitamin A; 3: no DDT, 10 μg vitamin A; 4: 5 mg DDT, 10 μg vitamin A; 5: no DDT, 25 μg vitamin A; 6: 5 mg DDT, 25 μg vitamin A. Subsequent liver samples were divided into 3 portions: one was frozen in liquid nitrogen to determine cytochrome P-450, one was deep frozen to determine the hepatic reserve of vitamin A, and one was prepared for histological examination. Results indicate that, despite a daily dose of 5 mg DDT, the cytochrome P-450 level is clearly reduced in the absence of vitamin A, as compared to group 1. This reduction disappears as soon as 10 μg retinol/day is administered. The cytochrome level was increased in groups 4 and 6 as compared to groups 3 and 5. The significant differences in cytochrome levels between groups 3 and 4, 2 and 4, and 2 and 6 point to the need for retinol in order for DDT to induce the enzyme. The 25 μg of vitamin A given did not lead to greater induction of cytochrome P 450, but improved by 6.4% the protein efficacy in group 6 as compared to group 4. With or without vitamin A, DDT increased the ratio of liver weight to body weight. Thus, retinol is necessary for the induction of cytochrome P-450.

76-1984. Le Patourel, G. N. J.; Wright, D. J. (Dep. Zool. Appl. Entomol., Imperial Coll., London, England). **Formation of optically-active metabolites of the organophosphorus pesticide phorate by nematodes and microorganisms.** *Comp. Biochem. Physiol.* 53(2C): 73-74; 1976. (17 references)

When the organophosphorus pesticide phorate was metabolized by the free-living soil nematodes *Panagrellus redivivus* and *Aphelenchus avenae*, the bacterium *Bacillus megaterium*, and the fungus *Aspergillus niger*, the sulfoxides formed were optically active, all showing circular dichroism with positive or negative maxima around 220 nm. Phorate sulfoxide was the predominant sulfoxide produced by the two microorganisms and by *P. redivivus*, while *A. avenae* also formed phoratoxon sulfoxide. The nematodes and microorganisms differed in the predominant enantiomer which they could produce. The chirality of the sulfoxide metabolites of organophosphorus and carbamate pesticides containing sulfide groups, whether they are formed within an animal or in its environment, may have a direct effect on the toxicity of the pesticide to that animal.

76-1985. Burns, K. A. (Woods Hole Oceanographic Inst., Woods Hole, MA 02543). **Microsomal mixed function oxidases in an estuarine fish, *Fundulus heteroclitus*, and their induction as a result of environmental contamination.** *Comp. Biochem. Physiol.* 53(4B): 443-446; 1976. (14 references)

A hepatic microsomal mixed function oxidase (MFO) system was characterized in vitro in the estuarine fish *Fundulus heteroclitus*. The oxidation of aldrin by *Fundulus* microsomes required NADPH and a CO-binding component, the calculated Michaelis constants and *V*max being on the same order of magnitude as those reported in freshwater fish. The inducibility of the enzyme system was indicated by an increase in the specific activity of aldrin epoxidation rates, the levels of cytochrome P-450, and liver microsomal protein when exposed *in vitro* and *in vivo* to phenylbutazone. The results are consistent with the hypothesis that environmental contamination induces high levels of MFO in fish. Although *Fundulus* and other fish may have an efficient mechanism for oxidizing and excreting transient, sublethal doses of several foreign compounds, the induction of drug metabolizing enzymes does not insure survival in chronically or heavily polluted environments.

76-1986. Pfister, R. M. (Dept. Microbiol., Ohio State Univ., Columbus, OH). **Interactions of halogenated pes-**

ticides and microorganisms: a review. *Crit. Rev. Microbiol.* 2(1): 1-33; 1972. (10 references)

This review of the literature in the field of microbial-halogenated pesticide interactions concludes that little effect appears to be exerted by these compounds on human health and welfare. However, these chemicals are not inert in the microbial world and they may be interacting in an insidiously slow manner, changing the environment. Specific topics covered in this review include: the effects of halogenated compounds on microorganisms; metabolism of halogenated pesticides; biodegradation of pesticides; conversion of DDT and DDD; microbial accumulation of pesticides; toxicity; anaerobic activity; persistence of pesticides; the effects of pesticides on photosynthesis; and pesticide effects on nitrogen metabolism.

76-1987. Kupfer, D. (Worcester Foundation Exp. Biol., Shrewsbury, MA). **Effects of pesticides and related compounds on steroid metabolism and function.** *Crit. Rev. Toxicol.* 4(1): 83-124; 1975. (206 references)

In the review emphasis was placed on studies involving two types of interactions of chlorinated hydrocarbons with steroidal hormones. In one interaction, which is attributed to the induction of hepatic monooxygenase by chlorinated hydrocarbons, increased rates of steroid hydroxylation are exhibited, which in turn may yield potential hindrance in steroid-mediated functions. The second type of interaction may involve binding of DDT derivatives, primarily *o,p'*-DDT, to steroid hormone receptors. In this second interaction, the DDT derivatives appear to mimic the action of natural estrogens in ability to perform various estrogen-like actions. Such effects on steroid metabolism and function caused by inadvertent intake of chlorinated hydrocarbons have been considered in attempts to explain reproductive problems in particular species. However, there is some question as to whether the doses of chlorinated hydrocarbons administered in laboratory studies are comparable to those experienced in natural settings. The rate and mode of metabolism of a given chlorinated hydrocarbon and its retention may be influenced by other environmental factors as well. It is concluded that much work is necessary before the interesting findings on interactions of chlorinated hydrocarbons in laboratory experiments can be applied to real situations.

76-1988. de Jong, L. P. A.; Wolring, G. Z. (Chem. Lab., TNO, Rijswijk, The Netherlands). **Inhibition of acetylcholinesterase by *N*-alkylpyridinium and *N*-alkylpyridinium- 2-aldoxime salts.** *Croat. Chem. Acta* 47(3): 383-391; 1975. (17 references)

The interaction of series of *N*-alkylpyridinium and *N*-alkylpyridinium- 2-aldoxime salts with bovine erythrocyte acetylcholinesterase was studied in relation to inhibition of the hydrolysis of the substrates acetylcholine and dimethylaminoethyl acetate. A mixed inhibition of the acetylcholine hydrolysis was caused by the compounds, which is interpreted as an interaction with the free enzyme and with acetyl enzyme. The compounds appear to have a higher affinity for the free enzyme than for the acylated enzyme. Enlarging the alkyl group increased the binding capacity for the free enzyme. The aldoxime group had little effect on the binding to the free enzyme, but tended to increase the binding to the acetyl enzyme. The results suggest that a ternary complex of enzyme, substrate, and pyridininum compound may be formed which, in the case of dimethylaminoethyl acetate, causes more rapid acetylation of the enzyme.

76-1989. Mungikar, A. M.; Pawar, S. S. (Div. Biochem., Dep. Chem., Marathwada Univ., Aurangabad, Maharashtra, India). **The effect of toluene, phenobarbital and 3-methyl-cholanthrene on hepatic microsomal lipid peroxidation.** *Current Sci.* 45(1): 22-24; 1976. (13 references)

Adult male and female Hindustan antibiotic strain rats were treated with toluene (0.72 ml/kg, po for 2 successive days), phenobarbital (80 mg/kg, ip for 3 days), and/or 3-methylcholanthrene 20 mg/kg, ip for 2 days). Twenty-four hr after the last treatment, the animals were killed and the liver microsomes isolated. Lipid peroxidation was measured. Phenobarbital and 3-methylcholanthrene treatment lowered the NADPH linked and ascorbate induced lipid peroxidation. Toluene also lowered both the NADPH-linked and ascorbate-induced lipid peroxidation, but the decrease was greater in male than in female rats. Lipid peroxide formation was further decreased in rats pretreated with phenobarbital prior to toluene administration and in male rats pretreated with 3-methylcholanthrene prior to toluene administration. The inhibitory effect of toluene on lipid peroxidation may be due to the antioxidant property of toluene metabolites. Further reductions in rats pretreated with phenobarbital or 3-methylcholanthrene may be due to competition for a common flavoprotein, cytochrome c reductase, for the metabolism of these drugs.

76-1990. Skryabin, G. K.; Golovleva, L. A.; Solov'eva, T. F. (Acad. Sci. USSR, Pushchino-on-Oka, USSR). **Co-oxidation of phenoxyalkanoic acids by microbial cultures.** *Dokl. Biol. Sci.* 215(1-6): 160-161; 1974. (5 references)

The effect of microorganisms in co-oxidation conditions on the herbicides 2,4-D and 2M-4C (MCPA) was studied. The effect of these herbicides, phenoxyalkanoic acids, and ordram (molinate) were also investigated on the microflora of rice field soils. In the process of adaptation to toxicants, both the quantitative and species composition of microorganisms changed. Bacterial numbers and fungi numbers decreased sharply after ordram was introduced, but increased again after 1 to 1 1/2 mo. The phenoxyalkanoic acids did not significantly alter the microorganism spectrum composition. Cultures of *Arthrobacter, Nocardia*, and *Brevibacterium* withstood 2-4 times smaller concentrations of the herbicides 2,4-D and 2M4C when museum cultured as opposed to strains isolated from soils.

Neither museum strains nor soil isolated strains utilized phenoxyalkanoic acids as a source of carbon. In ordinary conditions it was concluded that only a negligible part of the microorganisms of soil are able to transform phenoxyalkanoic acids. When phenoxyalkanoic acids were introduced into cultures grown on other sources of carbon, i.e. in co-oxidation conditions, a significant number of the test cultures transformed the original phenoxyalkanoic acids into partly oxidized derivatives without disrupting the aromatic ring. Possibilities for using microorganisms for the transformation and degradation of toxic substrates are significantly expanded by the method of co-oxidation.

76-1991. Tevan, L.; Lang, F. (Eszakdunantuli Vizugyi Igazgatosag, Gyor, Hungary). **Az Abate szunyoglarvairtoszer hatasa a vizi okoszisztemara. [Effect of Abate mosquito larvicide on aquatic ecosystems.]** *Egeszsegtudomany* 19(4): 358-363; 1975. (7 references) (Hungarian)

The effect of Abate 1-SG (1% of the active ingredient temophos on coarse sand) on aquatic ecosystems was studied in connection with its extensive aquatic use as a mosquito larvicide in Hungary. The sensitivity of *Daphnia magna* was similar to that of the mosquito larvae. The reduction of the total algae count was not sizable even at Abate concentrations as high as 5-10 ppm. Even the relatively mild effect of Abate on aquatic ecosystems indicates that this larvicide should not be used in waters containing living organisms, and that the concentration in water should not exceed 0.1 ppm.

76-1992. Daneshvar, H.; Rodriguez, J. G. (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506). **Toxicity of organophosphorus systemic pesticides to predator mites and prey.** *Entomol. Exp. Appl.* 18(3): 297-301; 1975. (4 references)

The three systemic organophosphorus pesticides Di-Syston (disulfoton), Meta-Systox-R (oxydemeton methyl), and Systox (demeton) were added at rates of 0.002-0.032% a.i. to nutrient solutions in which bean plants were cultured. Adult female *Tetranychus urticae* and *Neoseiulus fallacis* were placed on the bean leaves, and some *N. fallacis* females were allowed to feed on *T. urticae* eggs which had been produced while females of that species were feeding on the bean leaves. At all concentrations the pesticides were less toxic to *T. urticae* feeding on the plant than to *N. fallacis* preying on *T. urticae*. Of the three pesticides, Di-Syston was the least toxic to both mite species. When *T. urticae* were cultured on detached bean leaves placed on cellucotton in nutrient solutions containing the same pesticide concentrations, their eggs were also toxic to *N. fallacis*. Longevity studies using ^{32}P-labeled foliage showed that *N. fallacis* are incapable of feeding directly on bean leaves.

76-1993. Gillott, M. A.; Floyd, G. L.; Ward, D. V. (Botany Dep., Rutgers Univ., New Brunswick, NJ). **The role of sediment as a modifying factor in pesticide-algae interactions.** *Environ. Entomol.* 4(4): 621-624; 1975. (32 references)

In this study an evaluation of the role of sediments in pesticide-algae interactions was made by comparing the response of the algae in one and two compartment systems. The one compartment system consisted of axenic *Euglena gracilis* cultures and the two compartment system consisted of alga plus sediment. Photosynthetic activity was measured via carbon-14-incorporation. After 24 hr of exposure to either DDT or carbaryl, significant inhibition of photosynthesis in *E. gracilis* was noted at concentrations of 10 ppb or greater. Abate was only marginally inhibitory at a 100 ppb concentration. The presence of sediment was highly significant in reducing the inhibition for all 3 insecticides. This is an important factor to be considered in extrapolating results of simple laboratory experiments to field conditions. In nature, the presence of sediment would be expected to dampen the toxicity of insecticides, especially in shallow bodies of water where there is a large surface to volume ratio.

76-1994. Gupta, P. K.; Kapoor, V. (Ind. Toxicol. Res. Cent., Dept. Biophys., Punjab Univ., Chandigarh, India). **Influence of malathion on phosphatase and succinic dehydrogenase in preirradiated rats.** *Environ. Physiol. Biochem.* 5(6): 370-372; 1975. (8 references)

The influence of malathion on phosphatase and succinic dehydrogenase was studied in preirradiated rats. Female albino rats were divided into groups and acid and alkaline phosphatase and succinic dehydrogenase were studied for 2 to 48 hr after a single dose of malathion (50 mg/kg, i.p.) and radiation (37 r/min for 24.30 min; total dose 900 r) were administered. At a dose level of 50 mg/kg of malathion, no significant change in acid and alkaline phosphatase and succinic dehydrogenase of rat liver and spleen tissues was noted. Radiation, however, caused a significant decrease in acid and alkaline phosphatase and an increase in succinic dehydrogenase of liver and spleen for 6 to 48 hr. When malathion was given to irradiated rats the general effect was similar and the effect was enhanced during the period of study. With radiation alone the effect on phosphatase and succinic dehydrogenase reached a maximum between 24 and 48 hr; with the combined treatment the maximum was reached earlier (2 hr) and lasted up to 48 hr. It is concluded that malathion adds to and enhances the effect of radiation even though malathion itself had no effect on the parameters studied.

76-1995. Rashid, S.; Roohi, R. A.; Naqvi, S. N. H. (Inst. Physiol. Chem., 355 Marburg/Lahn, Germany). **Characterization of acid phosphatase and its relation with insecticide metabolism in *Bruchus chinensis* (Linnaeus).** *Environ. Qual. Sfety* 2:209-218; 1973. (61 references)

An investigation was made in an attempt to understand the basic cause of insecticide resistance by studying phosphomonoesterase levels in treated and normal insects. Acid phosphatase was characterized biochemically in

the homogenate of *Bruchus chinensis* (L.) and optimum factors were reported. Optimum pH was 4.0; *K*m value $1.25 \times 10^{-3} M$; and an optimum temperature of 41°C for a 30 min incubation period. Enzyme activity was decreased by in vivo treatment with the chlorinated insecticides, ovex and petkolin, but increased on treatment with the organophosphate insecticide, Zolone (phosalone). The oxygen rate was simultaneously measured to find any correlation between metabolic reactions and enzyme behavior. Rate of respiration increased with increasing insecticide concentrations at 1 hr with Petkolin and Zolone, and even at the 3 hr mark with Ovex. At 24 hr the rate of respiration decreased with increasing concentration in the case of Petkolin and Zolone, but not in the case of Ovex. The results of this study allow the conclusion that metabolic reactions have some correlation with the toxicity of the insecticides while changes in the phosphatase level are under different genetic controls and thus are dependent on some other biochemical reaction. There is some correlation, however, between this biochemical reaction and insecticide metabolism.

76-1996. Dikshith, T. S. S.; Datta, K. K.; Pandya, K. P. (Ind. Toxicol. Res. Cent., Lucknow, India). **Effect of DDT on the free amino pool of brain and kidney in guinea-pigs.** *Environ. Physiol. Biochem.* 5(6): 404-407; 1975. (13 references)

A study was made of the composition of free amino acids in the brain and kidney of guinea pigs after treatment with *p,p'*-DDT by means of skin painting. Animals in one group were treated with 400 mg/kg/day for 20 days. The DDT treatment produced depletory effects in the free amino acid pool of brain and kidney in treated animals. A significant fall in brain alanine and aspartic acid and in kidney histidine, lysine, and glycine/threonine was noted. The level of phenylalanine was much decreased in both brain and kidney. Gamma-amino butyric acid disappeared completely from the brain and valine, proline, and tyrosine from the kidneys of the treated animals. It is suggested that the decreases in alanine, proline, valine, tyrosine, glutamine, and gamma-amino butyric acid may be due to various metabolic complexities induced by the slow action of DDT. It is suggested that prolonged exposure to this chemical be avoided.

76-1997. Virgo, B. B.; Bellward, G. D. (Div. Pharmacol. Toxicol., Fac. Pharm. Sci., Univ. British Columbia, Vancouver, Canada). **Effects of dietary dieldrin on reproduction in the Swiss-Vancouver (SWV) mouse.** *Environ. Physiol. Biochem.* 5(6): 440-450; 1975. (30 references)

A study was made of reproduction in dieldrin-fed Swiss-Vancouver (SWV) mice. The mice had raised one litter and then were given 0, 2.5, 5, 10, 15, 20, or 25 parts per million of dietary dieldrin. Exposure began 4 weeks prior to the second mating and continued until day 28 postpartum. Significant mortality occurred among females only at 20 and 25 ppm levels. All deaths occurred before parturition. Dieldrin did not affect behavioral estrus. At 10 and 15 ppm, 18% of the females which were bred did not become pregnant. At lower doses animals were fertile. Gestation was not affected. At 25 ppm, the litter size was decreased by 17%. Infertility and reduced fecundity resulted from a lesion(s) preceding implantation. Preweaning mortality of all pups occurred in 31%, 47%, 80%, and 100% of the litters at 0, 2.5, 5, and greater than or equal to 10 ppm, resp. Pup survival was not affected at 2.5 and 5 ppm. Thus litter loss was dieldrin's most important reproductive effect and correlated with a dieldrin-induced maternal hepatomegaly. Pup killing and pup neglect were important causes of mortality, but only in doses equal to or exceeding 15 ppm.

76-1998. Thirugnanam, M.; Forgash, A. J. (Dep. Entomol. Econ. Zool., Rutgers, The State Univ., New Brunswick, NJ 08903). **Environmental impact of mosquito pesticides: influence of temefos on the brain acetylcholinesterase of killifish.** *Environ. Physiol. Biochem.* 5(6): 451-459; 1975. (23 references)

The influence of temefos on the brain AChE of killifish was studied under in vitro conditions where the compound is not subjected to physical and biochemical degradation, under in vivo conditions in the lab in the absence of other physical and biological factors, and in the total environment under field conditions. While temefos was not inhibitory at levels up to 10.7 m*M* in brain homogenate samples, its metabolites were active within the range of 0.2 μM to 1.26 m*M* in causing a 50% reduction in the enzyme activity. Exposure of *Fundulus heteroclitus* to temefos under lab conditions reduced AChE activity proportional to the pesticide concentration and exposure period. Visible symptoms of organophosphate poisoning were noted only after the AChE inhibition reached 80%. *F. heteroclitus* and *Cyprinodon variegatus* exposed to 10 biweekly applications in the field showed no inhibition of brain AChE. However, exposure to biweekly applications of temefos emulsion caused reductions in the enzyme by 50%, but only in the pre-third application samples. A gradual increase in brain AChE occurred in both *F. heteroclitus* and *C. variegatus* as the season progressed from April to October.

76-1999. Mendoza, C. E.; Grant, D. L.; Shields, J. B. (Food Res. Div., Bureau Chem. Safety, Natl. Health Welfare, Ottawa, Ontario, Canada). **Body burden of hexachlorobenzene in suckling rats and its effects on various organs and on liver porphyrin accumulation.** *Environ. Physiol. Biochem.* 5(6): 460-464; 1975. (15 references)

HCB and porphyrin accumulation were determined in the organs of suckling rats whose mothers were fed a diet containing 80 ppm HCB, from 2 weeks before mating to the time of the second litter. At age 18 days the pups were sacrificed. Among the organs examined, the highest HCB residue was in the liver, followed in order by the kidney, lung, brain, spleen, and heart. Both F1a and

F1b groups had comparable HCB concentrations in the liver and brain. Porphyrin levels were 2.5 fold higher than control pups. HCB treatment did not influence body weight. Liver weight was significantly increased by HCB treatment, whereas the treatment significantly decreased weights of the kidney, brain, spleen, and heart. The accumulation of HCB in different organs and porphyrin in the liver of the suckling Wistar rats was about equal for males and females.

76-2000. Abou-Donia, M. B.; Menzel, D. B. (Dep. Physiol. Pharmacol. Med., Duke Univ. Med. Cent., Durham, NC 27710). **DDT: the degradation of ring-labeled ^{14}C-DDT to $^{14}CO_2$ in the rat.** *Experientia* 32(4): 500-501; 1976. (12 references)

A study was made to determine whether the rat is capable of degrading the phenyl ring of *p,p'*-DDT. Rats were given a single oral dose of 0.74 mg/kg of uniformly ring-labeled ^{14}C-DDT. Expired air was passed through a solution of ethanolamine-ethylene glycol monomethyl ether (1:2) to trap $^{14}CO_2$. There was a steady increase in the total radioactivity in the expired air. The daily rate of ^{14}C excreted reached a peak on the second day after administration, then sharply decreased until the eighth day when it leveled off. These results suggest that the oxidation of the phenyl groups of *p,p'*-DDT to CO_2 is a major pathway for *p,p'*-DDT metabolism in the rat. Only a total of 1.6% of the radioactivity of the administered dose was recovered in the expired air within 10 days of ingestion at which time 10.5% remained in the tissues. Most of the ^{14}C was excreted in the feces (83.8%) and a small portion (1.6%) in the urine. However, the results of this study do represent the most radical change accomplished in vivo for a residual insecticide reported to date in mammals.

76-2001. Polyak, N. P.; Kozyntseva, P. V. Allergol. Dep., All-Union Res. Inst. Hyg. Toxicol. Pestic., Polymers and Plastics, Kiev, USSR). **Zastosuvannya alergeniv z khimichnikh rechovin yak antigeniv v imunotsitolgichnikh ta imunoserologichnikh reaktsiyakh. [Use of allergens from chemical substances as antigens in immunocytological and immunoserological reactions.]** *Fiziol. Zh. (Kiev)* 20(5): 686-689; 1974. (21 references) (Ukrainian)

Due to an increase in allergic illnesses caused by widespread application of various chemical substances in industry, environment, and farming, a specific complex of allergy experiments using chemical substances as antigens is of special significance. Specific concentrations of chemical substances were introduced into and their effects observed on a degranulation reaction of fat cells, basophiles, and blast-transformed lymphocytes according to Uanine and Nikolaev's reaction. Immunologic reactions of chemical substance antigens must indicate the following: in cytological reactions solutions of chemical subtances alone should not cause cell damage; in the presence of suitable antibodies in serum, the complex antibody created causes cell damage or transformation; the chemical substance solution utilized as antigen should be clear and colorless; in the presence in blood plasma of antibodies to a given antigen a Uanine reaction of the latter causes solution cloudiness. Solutions of chemical substances used widely in agriculture were used as antigens; among them were hygromycin, formaldeyhyde, phytobacteriomycin, DDT, metaphenylenediamine, and metatoluenediamine. Experimental results indicate that a number of chemical substances in specific concentrations may serve as antigens in certain immunocytological and immunoserological reactions.

76-2002. Fedorov, V. V. (Sechenov Inst. Evolut. Physiol. Biochem., Acad. Sci. USSR, Leningrad, USSR). **Vliyaniye ingibitorov kholinesterazy na sinapticheskiye potentsialy nervno-myshetsnogo soyedineniya lyagushki. [Effect of the cholinesterase inhibitors on synaptic potentials of the frog neuromuscular junction.]** *Fiziol. Zh. SSSR* 62(3): 399-404; 1976. (21 references) (Russian)

The action of prostigmine and the organophosphorus inhibitor armine on synaptic potentials in the frog cutaneus-pectoris nerve-muscle preparation served to increase the miniature end plate potential (m.e.p.p.) and end plate potential (e.p.p.) amplitudes and lengthen the rise and the half-decline time of the e.p.p. in approximately similar ways. The effect of armine developed faster than that of prostigmine. The presynaptic effects of both anticholinesterases developed far more slowly than their post-synaptic effects. After prostigmine pretreatment for 2 hr, the addition of armine caused lengthening of the time-course of e.p.p.s, but the presynaptic effect was not changed. After pretreatment with armine, prostigmine did not cause any further effect. A discussion is given of possible mechanisms for the presynaptic effects of the inhibitors.

76-2003. Stern, P.; Valjevac, K.; Gmaz-Nikulin, E. (Dep. Pharmacol. Pathol., Med. Fac., Univ. Sarajevo, Sarajevo, Yugoslavia). **An attempt at treating progressive muscular dystrophy with DDT.** *Folia Med. Fac. Med. Univ. Saraeviensis* 9(9): 9-17; 1974. (18 references)

Results are discussed as observed in the DDT treatment of Mendell's model of muscular dystrophy. Male Wistar rats were treated with daily p.o. doses of DDT at 10 or 25 mg/kg. DDT treatment at either dose level resulted in statistically significant improvement of muscular function over untreated controls. Treated animals had dystrophic lesions which were less severe than in controls. Also, necrotic foci were smaller and less abundant. Muscular atrophy and degeneration, and sometimes hypertrophy, were apparent in most experimental samples. Resorptive-proliferating processes paralleled the dystrophic lesions in strength. No changes were noted on the blood vessels in any experimental sample. The results of this study indicated that the action of DDT observed with Mendell's progressive muscular dystrophy model is very similar to that observed with Selye's model as de-

monstrated earlier. From these studies it is concluded that progressive muscular dystrophy is a primarily neurologic disorder, caused by damaged ACh release at the neuromuscular junction, and that an analogy exists between progressive muscular dystrophy and botulinum toxin poisoning with respect to impaired ACh release as their common factor.

76-2004. Fiveland, T. J. (Author address not given). **Transport og nedbryting av amitrol i *Agrostis gigantea*. [Translocation and metabolism of 3-amino-1,2,4-triazole in *Agrostis gigantea*.]** *Forsk. Fors. Landbruk.* 25(6): 413-421; 1974. (10 references) (Norwegian)

Experiments were conducted to determine the translocation and metabolism of amitrole in *Agrostis gigantea* Roth. ^{14}C-Amitrole translocation was dependent on the stage of development. The compound translocated from the treated shoot to all other shoots at the 1-leaf and 2-3-leaf stages of development, but at the 4-5 leaf stage, only small amounts translocated out of the treated shoot. However, at this later stage, it was fully distributed in the treated shoot and translocated to the roots and to young developing rhizomes. Main shoots were independent of each other when new rhizomes developed. The compound was metabolized in the treated leaf to 2 main metabolites, one of which was further metabolized to the other. In the developing leaf metabolite A composed over 90% of the activity after 24 hr and was slowly metabolized to metabolite B. It is suggested that differences in the rates of metabolism may account for differences in susceptibility for low dosages of amitrole among various species.

76-2005. Zhilenko, V. N. (Leningrad, USSR). **Izucheniye toksichnosti tetrametiltiuramdisul'fida pri odnovre mennom postuplenii ego v organizm krys s vodnoi i vozdukhom. [Study of the TMTD (tetramethylthiruam disulfide) toxicity during simultaneous administration with water and air into the organism of rats.]** *Gig. Tr. Prof. Zabol.* 2: 42-44; 1976. (7 references) (Russian)

A six month experiment was conducted to determine the toxicity of TMTD (thiram) given separately or with water and air to rats. TMTD (thiram) given with water at a dose of 1 mg/kg (20 mg/l) caused marked changes in blood composition along with functional disorders in the liver and kidneys. A dose of 0.04 mg/kg (0.8 mg/l) was ineffective in regard to its toxic action. Inhalation of TMTD at the MAC level did not produce any changes in test animals compared to controls. Simultaneous supply of TMTD with drinking water in a dose of 0.04 mg/kg and with air at levels of the existing MAC brought about functional changes as reflected by a number of indices (STI, blood hemoglobin content, diurnal diuresis, chloride level in the urine); this is considered to be a manifestation of the additive effect of TMTD.

76-2006. Sedokur, L. K.; Luk'yanchuk, V. D. (Inst. Hyg. Toxicol. Pestic., Polymers and Plastics, Kiev, USSR). **Ksanturenovaya atsiduriya kak spetsificheskikh test pri intoksikatsii ditiokarbamatami. [Xanthurenic aciduria as a specific test for dithiocarbamate intoxication.]** *Gig. Tr. Prof. Zabol.* 2: 55-56; 1976. (6 references) (Russian)

Xanthurenic aciduria was studied for its specificity in tests for dithiocarbamate poisoning in male rats and in occupationally exposed workers. The animals received oral doses of TMTD (thiram), carbothion and tetraethylthiuram disulfide together with DL-tryptophan. The urine xanthurenic acid level, measured 24 hours later, was significantly increased (731.1, 482.7, and 430 μg/day, respectively), as compared with the controls (278.8 μg/day) and with rats treated with organochlorine and organophosphorus pesticides. The xanthurenic acid level in the urine of workers exposed to TMTD was 38.5-59.6 mg/day against a normal level of 20-25 mg/day. No increase was observed in the urine xanthurenic acid level in workers exposed to hexachlorocyclohexane (BHC). The findings indicate the specificity of the xanthurenic aciduria test for dithiocarbamate poisoning.

76-2007. Malik, J. K.; Bahga, H. S.; Sud., S. C. (Govind Ballabh Pant Univ. Agric. Technol., Pantnagar, Uttar Pradesh, India). **Evaluation of therapeutic measures in acute dieldrin poisoning in buffalo calves.** *Indian J. Anim. Sci.* 43(8): 711-714; 1973. (18 references)

Dieldrin (25 mg/kg) was administered by stomach tube to 12 buffalo calves aged about 12 months. Soon after the appearance of clinical symptoms, the animals were given chloral-mag, atropine sulfate, glucose, *d*-tubocurarine, and calcium borogluconate. A second dose was given when the clinical symptoms reappeared, and chloral-mag alone was given thereafter whenever severe symptoms of poisoning appeared. All animals developed signs of poisoning within 16 hr of dieldrin administration. The signs included hyperesthesia, dilated pupils, staggering gait, muscular stiffness, increased salivation, muscle spasms, incoordination, increased micturition, and dyspnea. Although the treatment measures significantly prolonged the survival time as compared with untreated dieldrin-poisoned controls, they were unable to save the affected animals. The best survival time was achieved with chloral-mag, atropine sulfate, and glucose/saline. Post-mortem findings were typical of those seen in cases of chlorinated insecticide poisoning. Dieldrin significantly elevated the total number of blood leucocytes and the percentage of lymphocytes and neutrophils without producing any changes in the hemoglobin, hematocrit, or erythrocyte values. The blood glucose and blood lactic acid levels increased 2.5 and 4 fold, respectively.

76-2008. Mukherjee, S.; Bhattacharya, S. (Dep. Zool., Visva Bharati Univ., Santiniketan 731235, India). **Histopathological lesions in the hepatopancreas of fishes exposed to industrial pollutants.** *Indian J. Exp. Biol.* 13(6): 571-573; 1975. (12 references)

The impact of damage done by industrial pollutants was studied on the hepatopancreas of two common Indian fresh water teleosts, *Ophiocephalus punctatus* (Bloch.) and *Clarias batrachus* (Linn.) The fish are exposed to phenol, ammonia, copper sulfate, and sodium sulfide as well as a combined factory effluent. At the 48 hr TLm concentration, copper sulfate was the most dangerous of the various pollutants. Exposure to the effluent for 48 hr and for 90 days did not cause death, but did result in lesions, with greater damage occurring over the period of longer exposure. The changes in the organ due to the exposures were more or less similar, but again they varied in magnitude.

76-2009. Ganguli, S.; Siddiqui, K. A. I.; Banerjee, A. K. (Microbiol. Lab., Dep. Botany, Burdwan Univ., Burdwan, India). **Effect of antifungal agents on the vitro growth of Rhizobia and on the formation of root nodules in excised root cultures of *Phaseolus mungo*.** *Indian J. Exp. Biol.* 13(6): 588-590; 1975. (7 references)

The effect is reported of 7 selected antifungal agents on in vitro growth of 8 strains of *Rhizobia* and on the formation of root nodules in excised root cultures of *Phaseolus mungo*. The effect of the antifungal compounds on in vitro growth of bacteria was tested by adding them at 1, 5, 10, 100, and 1000 μg/ml concentrations to culture tubes. Of those compounds tested, fytolan and agrosan GN proved highly toxic to rhizobia in cultures and caused 50-100% inhibition of growth of 8 strains at 1 μg/ml. Aureofungin, brassicol (PCNB), dithane Z-78 (zineb), captan, and hexaferb (ferbam) were not inhibitory except at very high concentrations. Instead they caused an increase in the in vitro growth of rhizobia. Fytolan and agrosan also caused complete inhibition of nodulation in excised root cultures of *P. mungo* when applied through the hypocotyl cut end. When agrosan, brassicol, and dithane were incorporated into the rooting medium, similar inhibitory effects were noted. Root growth was adversely affected by some of these agents.

76-2010. Sinha, S. N.; Ray, B. K.; Goswami, B. B.; Bhattacharrya, P.; Dube, D. K. (Dep. Biochem., Univ. Calcutta, 35, Ballygunge, Calcutta-700019, India). **Levels of some nucleic acid hydrolases during growth inhibition and subsequent regression of mouse fibrosarcoma by treatment with rotenone.** *Indian J. Med. Res.* 63(12): 1737-1746; 1975. (20 references)

Preliminary studies were conducted with rotenone on the growth, survival, and profiles of some important lysosomal and non-lysosomal nucleic acid hydrolases during growth inhibition and regression of mouse fibrosarcoma (MFS). Solid tumor MFS was maintained in serial transplantation in inbred Swiss mice. Rotenone was given to the animals at 2 mg/kg and 3 mg/kg. Treated mice were injected locally directly into the tumor, daily, with rotenone. In ten other mice, rotenone treatment was started 10 days after transplantation and was continued daily. Rotenone inhibited the growth of transplanted fibrosarcoma and induced regression of the tumor after a certain stage. However, it failed to regress a full grown tumor. The levels of two lysosomal nucleic acid hydrolases, acid DNase and RNase, increased sharply and one non-lysosomal nucleic acid hydrolase, alkaline DNase, increased in a stepwise manner when rotenone was started at an early stage of tumor growth. The activity of the lysosomal nucleic acid hydrolases increased progressively during treatment, reflecting an intracellular release of the enzyme in the tumor cells.

76-2011. Brodie, J. (Wildlife Investigation Sect., Dep. Agric. Fisheries for Scotland, Sci. Serv., East Craigs, Edinburgh, Scotland). **Anticoagulant resistant rats (*Rattus norvegicus*) in Scotland.** *Int. Pest Contr.* 18(1): 7-10; 1976. (15 references)

A study of the distribution and status of resistance in rats to anticoagulant drugs in Scotland was carried out between January 1973 and March 1975. After one week of quarantine, healthy captured rats were tested for resistance by subjecting them to 6 days of feeding on a diet of plain oatmeal containing 0.005% warfarin. They were classified as resistant if they ate regularly through the 6 day period and then survived for a further 3 weeks on standard laboratory diet. The response of rats which were classified as resistant to warfarin was variable, ranging from those which were apparently unaffected to those which hemorrhaged, suffered paralysis, tremors, and other symptoms, and almost died. Some rats ate well for 6 days with no drop in food consumption and subsequently showed signs of warfarin poisoning. Further study showed that the migration of resistant rats from the original resistance areas may have taken place at a rate which would account for the entire distribution of resistant infestations, requiring an average rate of spread of about 7 km/yr. The continuing spread of resistant rats across the central lowlands will undoubtedly make it increasingly more difficult to control rats throughout this large tract of country. However, the nature of the resistance in this area did not appear as strong or as readily inherited as in the original resistance pockets.

76-2012. Akhundov, V. Yu.; Akhundov, K. F.; Mamedova, A. P. (Author address not given). **Vliyaniye abata (difosa) na obshchiy sanitarnyy rezhim vodoemov. Soobshcheniye II. [Effect of abate on the general sanitary conditions of water bodies. Part II.]** *Izv. Akad. Nauk Az. SSR Ser. Biol. Nauk* 2: 112-117; 1974. (3 references) (Russian)

The effect of different concentrations of abate (temophos, 5.5, 0.55, and 0.055 mg/liter concentrations of a 92% preparation and 60.6, 6.06, and 0.606 mg/l concentrations of an 88% preparation) on certain biological and chemical parameters of water was studied under laboratory conditions. All but the 0.606 mg/l dose increased the organic matter content, and all concentrations reduced the oxygen content of the water. All doses reduced the biolog-

ical oxygen consumption and increased the ammonia concentration in the water throughout the 30 day-experiment. The 0.055 mg/l dose did not interfere with the nitrification process. This dose slightly stimulated the growth of microorganisms, while all other doses exerted a depressive effect. Abate did not influence the water pH.

76-2013. Evdokimov, E. S.; Klochkova, G. M. (Turkmenian Scientific Research Institute of Animal Husbandry and Veterinary Medicine, USSR). **Vliyaniye khlororganicheskikh pestitsidov na endokrinnyyu sistemu i soderzhaniye askorbinovoy kisloty v organizme krupnogo rogatogo skota. [Effect of chlororganic pesticides on the endocrine system and ascorbic acid content in cattle.]** *Izv. Akad. Nauk Turkm. SSR Ser. Biol. Nauk* 6: 25-30; 1974. (15 references) (Russian)

The effect of DDT and lindane was studied on the function of the endocrine glands and on the plasma ascorbic acid levels of healthy and diseased cattle. Fed to healthy young bulls in daily doses of 200 mg/kg for a prolonged time, DDT and lindane caused an initial stimulation of the endocrine glands, which was followed by a general depression, especially of the adrenal cortex. Similar findings were obtained in cattle with endemic disturbances of the central nervous system. The plasma ascorbic acid level of the healthy bulls did not differ markedly from that of the control group, but it was reduced to half in sick animals fed DDT and lindane.

76-2014. Krumzdorov, A. M. (Dep. Agric. Exp. Methods, Timiryazev Agric. Acad., USSR). **Deystvie dikamby na gorchak polzuchiy i skorost' ee inaktivatsii v zavisimosti ot srokov obrabotki. [Action of dicamba on *Acroptilon repens* and its inactivation rate as a function of treatment periods.]** *Izv. Timiryazevsk. S'kh. Akad.* 3: 163-168; 1975. (10 references) (Russian)

When dicamba was applied to *Acroptilon repens* in the rosetting and shoot-forming stages at the rate of 20 kg/ha in field experiments, dicamba residues were not found in corn the following year. When treatment was applied at the stage of budding and early blossoming residues were still present one year later. Dicamba degradation products detected in treated plants included 3,6-dichlorosalicylic acid, *p*-aminobenzoic acid, and benzoic acid; these metabolites were detected in corn 2-3 years after treatment. They could account for persistent depression of corn growth in soil treated with dicamba.

76-2015. Wieneke, J.; Steffens, W. (Dep. Radioagron., Kernforschungsanlage Juelich, 517 Juelich, Germany). **Translocation and metabolism of azinphos-methyl in bean plants after root and leaf absorption.** *J. Agric. Food. Chem.* 24(2): 416-418; 1976. (11 references)

Studies were conducted to determine whether azinphos behaves as a systemic insecticide. ^{14}C-carbonyl-labeled azinphos was used in the study. Bean plants were treated when the primary leaves were fully unfolded. Azinphos was used at a concentration of 8 ppm. When ethanol was added to the nutrient solution, the roots of the bean plants appeared abnormal. After 1 day and still after 4 days of uptake an accumulation of radioactivity, preferentially in the roots, was noted. In the leaves the amount of radioactivity increased continuously up to the 7th day of uptake, to a level comparable to that found in the roots. The results of this experiment underline the fact that care must be taken when using ethanol as a solvent for chemicals in experiments with plants. After root uptake of azinphos, the main amount of radioactivity in the bean leaves was present in the polar fraction. However, total azinphos translocated into the stem and leaves increased with time after application. Leaf absorption was small and the absorbed compounds were almost exclusively found in an acropetal direction. Azinphos degraded readily inside the plant leaf. It is suggested that substantial systemic behavior of azinphos in bean plants should not be expected.

76-2016. Marshall, T. C.; Dorough, H. W.*; Swim, H. E. (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506). **Screening of pesticides for mutagenic potential using *Salmonella typhimurium* mutants.** *J. Agric. Food Chem.* 24(3): 560-563; 1976. (18 references)

The mutagenic activity of several pesticides and related analogues was examined with a set of four strains of *Salmonella typhimurium* (Ames assay, TA 1535 series; deep rough strains without excision repair). Nitrosocarbaryl, a derivative of the insecticide carbaryl, proved to be a potent base-pair substitution mutagen, showing activity at 0.5 μg/plate as well as demonstrating a relatively mild frameshift activity. Captan at 25 μg/plate showed both frameshift and base-pair substitution mutagenesis. The mutagenic properties of these two compounds decreased when exposed to rat liver homogenate. DDT, DDE, heptachlor, heptachlor epoxide, dieldrin, carbaryl, linuron, and diazinon were not mutagenic in this system. (Author abstract reprinted by permission of the American Chemical Society)

76-2017. Foster, T. S.; Khan, S. U. (Anim. Res. Inst., Agric. Canada, Ottawa, Ontario, Canada). **Metabolism of atrazine by the chicken.** *J. Agric. Food Chem.* 24(3): 566-570; 1976. (29 references)

Atrazine fed at 100 ppm in a standard laying ration for 7 days to hens did not produce any visible adverse physiological changes or evoke any symptoms of toxicity. There was no effect on egg production or egg weight. No residues of atrazine or its metabolites were detected in eggs. However, unchanged atrazine (I) and metabolites deethylated atrazine (II), hydroxyatrazine (V), and possibly deethylated hydroxyatrazine (VI) were present in excreta collected 24 h after hens had been fed the fortified ration. Some residues of atrazine and its metabolites continued to appear in the excreta up to the 4th day after the hens had been returned to the noncontaminated diet. It is

possible therefore that there had been some buildup of residues in the various tissues. It appears that the metabolism of atrazine in the hen proceeds mainly via partial *N*-dealkylation accompanied by hydrolysis. Metabolic dealkylation occurs at the ethylamino group resulting in metabolites II and VI. (Author abstract reprinted by permission of the American Chemical Society)

76-2018. Ruzo, L.; Jones, D.; Safe, S.*; Hutzinger, O. (Guelph-Waterloo Centre for Graduate Work in Chemistry, Univ. Guelph, Guelph, Ontario, Canada). **Metabolism of chlorinated naphthalenes.** *J. Agric. Food Chem.* 24(3): 581-583; 1976. (27 references)

1-Chloro-4-[H] naphthalene was administered to a pig and the 4-chloronaphthol metabolite retained 18% of the deuterium. 1,4-Dichloro- and 1,4-dibromonaphthalene gave 2,4-dihalonaphthols as the major products and the results are consistent with the intermediacy of arene oxides; decomposition of these intermediates is accompanied by a 1,2 migration of deuterium and halogen, respectively. 1,2-Dichloronaphthalene and 1,2,3,4-tetrachloronaphthalene also give phenolic metabolites; however, the higher chlorinated isomer, 1,2,3,4,5,6-hexachloronaphthalene, was not metabolized. (Author abstract reprinted by permission of the American Chemical Society)

76-2019. Van Alfen, N. K.; Kosuge, T. (Dep. Biol., Utah State Univ., Logan, UT 84322). **Metabolism of the fungicide 2,6-dichloro- 4-nitroaniline in soil.** *J. Agric. Food Chem.* 24(3): 584-588; 1976. (10 references)

A ^{14}C-labeled sample of 2,6-dichloro- 4-nitroaniline (DCNA, Botran) was incubated in flooded soil that had been amended with D-glucose (1%, w/w). After 3 days the amount of DCNA that could be recovered from the soil decreased to 7% and to 3% after 9 days. Evolution of radioactive carbon dioxide could not be detected even after the 9-day experimental period. Much of the radioactivity (ultimately 65%) could not be removed from the soil sample by extraction with an acetone-water solution. The major metabolite that was extractable from soil was identified as 4-amino-3,5- dichloroacetanilide (ADCAA). The expected metabolic precursor of ADCAA, 2,6-dichloro-*p*-phenylenediamine (DCPD), was also isolated from the extraction solution. A third compound isolated from soil appeared to be formed by the oxidative dimerization of DCPD. This same compound was also produced by the action of horseradish peroxidase on DCPD in vitro. Six fungi sensitive to DCNA were grown on potato-dextrose agar containing 10 μg/ml of DCNA, DCPD, or ADCAA. DCPD and ADCAA did not significantly affect the growth of any of the fungi tested as compared with controls whereas DCNA completely inhibited or reduced the growth rate in all cases. (Author abstract reprinted by permission of the American Chemical Society)

76-2020. Wiedmann, J. L.; Ecke, G. G.; Still, G. G. (Barberton Tech. Cent., Chem. Div., PPG Industries Inc., Barberton, OH 44203). **Synthesis and isolation of 1-hydroxy-2-propyl 3-chloroacarbanilate from soybean plants treated with isopropyl 3-chlorocarbanilate.** *J. Agric. Food Chem.* 24(3): 588-592; 1976. (13 references)

The metabolism of isopropyl 3-chlorocarbanilate (chlorpropham) to alkyl hydroxylated metabolite in soybean shoots was indicated by alkaline hydrolysis-distillation of 3-chloroaniline from polar plant extracts. The presence of 1-hydroxy-2-propyl 3-chlorocarbanilate (III) in hydroponically grown plants was confirmed by autoradiograms of two-dimensional TLC plates, both of III and the acetate derivative of III, *t*R of III on HPLC, and *t*R of the heptafluorobutyrate derivative of III on GLC. The presence of III in soil-grown plants was confirmed by the alkaline hydrolysis-distillation of 3-chloroaniline from polar extracts, *t*R of the acetate of III on HPLC and GLC, and the mass spectral analysis of the acetate of III. Soil grown soybean shoots produce a higher percentage of III when compared to the aryl hydroxylated metabolites which are the predominant metabolites found in hydroponically grown plants. Synthetic III (mp 88.5-91.0°C, 68%) was prepared by HCl cleavage of 1-triphenylmethoxy-2-propyl 3-chlorocarbanilate (V) (mp 138-139°C, 82%) which was prepared from 1-triphenylmethoxy- 2-propanol (IV) and 3-chlorophenyl isocyanate. (Author abstract reprinted by permission of the American Chemical Society)

76-2021. Nash, R. G. (Agric. Environ. Qual. Inst., Agric. Res. Serv., Beltsville, MD 20705). **Uptake of ethylenebis (dithiocarbamate) fungicides and ethylenethiourea by soybeans.** *J. Agric. Food Chem.* 24(3): 596-601; 1976. (24 references)

Radioactivity from soil treatments of 10 to 100 ppm of ^{14}C-labeled ethylenebis (dithiocarbamate) (EBDC) fungicides (nabam, zineb, and maneb) and 0.1 to 10 ppm of ethylenethiourea (ETU), a degradation product, is readily absorbed by soybeans and translocated throughout the plant. The presence of ETU on soybean leaves after EBDC foliar treatments decreased rapidly from < 20 ppm after 1 day to < 2 ppm after 15 days in the greenhouse. ETU applied to leaves of soybeans, which were kept outdoors, decreased from an initial level of 27 ppm to < 0.04 ppm after 14 days and was below detectable levels by 24 days. ETU content in soybeans from EBDC fungicide soil treatments remained low (< 0.2 ppm) throughout the 15-day monitoring period. Methanol extract from leaves contained degradation products (7 to 10) common to both ETU and the EBDC's, as determined by thin-layer chromatography. Ethyleneurea was the major degradation product. (Author abstract reprinted by permission of the American Chemical Society)

76-2022. Bull, D. L.; Whitten, C. J.; Ivie, G. W. (Cotton Insects Res. Lab., Agric. Res. Serv., College Station, TX 77840). **Fate of *O*-ethyl -[4-(methylthio)phenyl] *S*-propyl**

phosphorodithioate (BAY NTN 9396) in cotton plants and soil. *J. Agric. Food Chem.* 24(3): 601-605; 1976. (11 references)

About half the dose of ^{14}C- or ^{32}P-labeled BAY NTN 9306 (*O*-ethyl *O*-[4-(methylthio)phenyl] *S*-propyl phosphorodithioate) applied to the leaves of cotton plants was absorbed during the first 24 hr; surface and internal residues of the insecticide and its toxic derivatives diminished to insignificant levels after 8 and 32 days, respectively. The principal alteration products of BAY NTN 9306 found in different tests with plants, soil, and water were the toxic sulfoxide and sulfone derivatives formed by oxidation of the ethereal sulfur, and the respective substituted phenols, both free and conjugated, produced by hydrolysis of the organophosphorus esters. (Author abstract reprinted by permission of the American Chemical Society)

76-2023. MacNeil, J. D.; Hikichi, M. (Res. Stn., Agric. Canada, Summerland, British Columbia, Canada). **Degradation of endosulfan and ethion on pears and pear and grape foliage.** *J. Agric. Food Chem.* 24(3): 608-611; 1976. (5 references)

A mixture of endosulfan (6 lb of Thiodan-50 WP) and ethion (8 lb Ethion-25 WP) recommended for control of pear pyslla was applied to four experimental blocks of pear trees to study rates of degradation. In addition, two blocks of pears were treated with endosulfan (6 lb of Thiodan-50 WP) only and two blocks were treated with the endosulfan-ethion mixture to determine insecticide residues at harvest. Endosulfan residues on treated fruit were below the 2 ppm tolerance established for endosulfan on pears 14 days after application. Ethion residues were within the 1 ppm tolerance 20-35 days after application. Degradation rates of the two insecticides on pear and grape foliage are also reported. (Author abstract reprinted by permission of the American Chemical Society)

76-2024. Davison, K. L. (Metab. Radiat. Res. Lab., Agric. Res. Serv., Fargo, ND 58102). **Carbon-14 distribution and elimination in chickens given methoprene-^{14}C.** *J. Agric. Food Chem.* 24(3): 641-643; 1976. (12 references)

Distribution and elimination of carbon-14 given to chickens as methoprene-^{14}C (isopropyl (2E,4E)- 11-methoxy-3,7,11-trimethyl-2,4-dodecadienate-5-^{14}C) were investigated. When about 4 mg of methoprene was given in a single oral dose to colostomized chickens, elimination of carbon-14 was greatest in exhaled air; however, when 105 or 107 mg of methoprene was given, elimination of carbon-14 was greatest in urine. Up to 19% of the carbon-14 from a single dose of methoprene was eliminated over a 14-day period in the eggs of laying hens, and carbon-14 was detected in all tissues and organs examined. (Author abstract reprinted by permission of the American Chemical Society)

76-2025. Quistad, G. B.; Staiger, L. E.; Schooley, D. A. (Zoecon Corp. Res. Lab., Palo Alto, CA 94304). **Environmental degradation of the insect growth regulator methoprene. X. Chicken metabolism.** *J. Agric. Food Chem.* 24(3): 644-648; 1976. (16 references)

Treatment of Leghorn chickens with a single oral dose of [5-^{14}C]methoprene [isopropyl (2*E*,4*E*)-11-methoxy- 3,7,11-trimethyl- 2,4-dodecadienoate] resulted in residual radioactivity in tissues and eggs. The chemical nature of the residual radiolabel in tissue (muscle, fat, liver), eggs, and excrement was thoroughly examined at several doses (0.6 to 77 mg/kg). Although a high initial dose (59 mg/kg) resulted in methoprene residues in muscle (0.01 ppm), fat (2.13 ppm), and egg yolk (8.03 ppm), these residues of methoprene represented only 39 and 2% of the total ^{14}C label in fat and egg yolk, respectively. Radiolabeled natural products from extensive degradation of methoprene were by far the most important ^{14}C residues in tissues and eggs, particularly at the lower dose of 0.6 mg/kg where [^{14}C]cholesterol and normal [^{14}C]fatty acids (as triglyceride) contributed 8 and 71% of the total radiolabel in egg yolk. Novel minor metabolites of methoprene were observed in lipid depots, resulting from saturation of the dienoate system. These minor metabolites were conjugated to glycerol and/or cholesterol. (Author abstract reprinted by permission of the American Chemical Society)

76-2026. Hunt, L. M.; Gilbert, B. N. (U.S. Livestock Insects Lab., Agric. Res. Serv., Kerrville, TX 78028). **Metabolism and residues of ^{3}H- and ^{35}S-labeled ferbam in sheep.** *J. Agric. Food Chem.* 24(3): 670-672; 1976. (7 references)

^{35}S- and ^{3}H-labeled ferbam (Fermate) (ferric dimethyldithiocarbamate) was administered orally to 1 sheep, and only ^{35}S-labeled ferbam was administered to another sheep. By 76 hr, 82% of the ^{3}H moiety and 23% of the ^{35}S moiety had been excreted in feces and urine. None of the radiolabeled metabolites co-chromatographed with available metabolic standards, dimethylamine and tetramethylthiuram disulfide (thiram). Tissues of slaughtered sheep contained radiolabeled materials. (Author abstract reprinted by permission of the American Chemical Society)

76-2027. Akin, F. J. (Agric. Res. Serv., Richard B. Russell Agric. Res. Cent., Athens, GA 30604). **Antitumorigenic effect of maleic hydrazide on mouse skin.** *J. Agric. Food Chem.* 24(3): 672-674; 1976. (19 references)

Maleic hydrazide (MH; 1,2-dihydro-3,6-pyridazinedione), a tobacco sucker-control agent which has been detected in relatively high concentrations in cigarette smoke, was tested for tumorigenic activity on mouse skin. MH significantly inhibited the initiation" phase of two-stage tumorigenesis caused by 7,12-dimethylbenz[*a*] anthracene (DMBA) and 12-*O*-tetradecanoyl phorbol-13-acetate (TPA). The inhibitory activity of MH resembled that of its parent compound maleic anhydride. At 5000 times its residue level in

cigarette smoke, MH did not initiate tumor development on its own. (Author abstract reprinted by permission of the American Chemical Society)

76-2028. Miller, R. W.; Corley, C.; Oehler, D. D.; Pickens, L. G. (Chem. Biophys. Contr. Lab., Agric. Res. Serv., Beltsville, MD 20705). **Feeding TH 6040 to cattle: residues in tissues and milk and breakdown in manure.** *J. Agric. Food Chem.* 24(3): 687-688; 1976. (5 references)

Three dairy cows were fed Thompson-Hayward TH 6040 {*N*-(4-chlorophenyl) -*N'*- (2,6-difluorobenzoyl) urea{ at rates ranging between 0.25 and 16 mg/kg body wt per day for 4-5 months. No (< 0.02 ppm) TH 6040 was found in the milk of the cow fed as much as 8 mg/kg body wt, and even when 16 mg/kg body wt was fed, only 0.02 ppm was found in the milk. The maximum residue found in the body fat of this cow was 0.25 ppm. TH 6040 in the manure (exposure outdoors) of a cow fed 0.25 mg/kg body wt decreased over time at a rate described by a hyperbolic curve; the half-life was 4-5 days. (Author abstract reprinted by permission of the American Chemical Society)

76-2029. Pitts, G.; Rodriguez-Kabana, R.; Curl, E. A. (Dep. Bot. Microbiol., Auburn Univ., Auburn, AL). **Effect of the herbicide atrazine and two carbon levels on enzyme activities in soil monocultures of *Sclerotium rolfsii*.** *J. Ala. Acad. Sci.* 45(1): 54-65; 1974. (19 references)

The effect of atrazine (0, 2, 5, 10, and 20 μg/g soil) was studied on enzyme activities in soil monocultures of *Sclerotium rolfsii*. The soil was sterilized sandy loam adjusted to carbon:nitrogen levels of 10:1 and 50:1 with glucose. Analyses for enzymatic activity were performed to assess the growth response of the fungus. In the low-carbon soil, invertase production was significantly inhibited only at the 20 μg herbicide level of treatment. Polygalacturonase was not affected. In the high-carbon content soil, both invertase and poygalacturonase activities were inhibited by all levels of atrazine. This effect was inversely related to herbicide concentration with the 20 μg level providing the greatest amount of inhibition. These effects were accompanied by corresponding changes in soil pH and nitrate-nitrogen uptake. The results of this study allow the two following conclusions. First, soil enzyme activity may serve as a reliable indicator of fungal growth response to herbicide treatments. Second, relatively high concentrations of atrazine are needed to significantly inhibit the soil-borne plant pathogen, *S. rolfsii*, with the effect being dependent on the amount of carbon source available.

76-2030. Chlebowski, J. F.; Coleman, J. E. (Dep. Mol. Biophys. Biochem., Yale Univ., New Haven, CT 06510). **Mechanisms of hydrolysis of *O*-phosphorothioates and inorganic thiophosphate by *Escherichia coli* alkaline phosphatase.** *J. Biol. Chem.* 249(22): 7192-7202; 1974. (47 references)

A detailed study of the enzymic activity of the *O*-phosphorothioate monoesters was made in order to provide insight into the mechanisms of action of alkaline phosphatase. Hydrolyses of phosphate and *O*-phosphorothioate monoesters by Zn(II) and Co(II) alkaline phosphatases (*Escherichia coli*) were compared. The rate of hydrolysis of the *O*-phosphorothioate by the Zn(II) enzyme was about 100-fold slower than the hydrolysis of phosphate esters. However, the kinetic data shows that the stepwise mechanisms are apparently identical. Reaction of Zn(II) enzyme with *O*-phosphoro ^{35}S thioate at acid pH incorporated covalently linked ^{35}S into the enzyme during the transient phase of the reaction with no release of hydrogen sulfide. Therefore, a thiophosphoryl enzyme forms analogous to the phosphoryl enzyme formed by phosphate esters. However, hydrogen sulfide and inorganic phosphate are products of hydrolysis of inorganic thiophosphate by the enzyme. Sulfur substitution reduces the negative homotropic interactions between the two active sites. It is suggested that enzyme-catalyzed hydrolysis of thiophosphate and solvent-phosphate hydroxyl exchange proceed via a rate-limiting, pH-independent phosphorylation. Variations in the rates of hydrolysis found during this study reflect differences in the rates of the same mechanistic steps, suggesting the involvement of the metal ion in all processes required for catalytic hydrolysis.

76-2031. Ivey, M. C.; Kunz, S. E.; Mann, H. D. (ARS-USDA, Kerrville, TX 78028). **Ethion, ethion monooxon, and ethion dioxon: residues in the body tissues of turkeys confined in pens on treated soil.** *J. Econ. Entomol.* 68(3): 353-354; 1975. (3 references)

A study was made of the residues of ethion and metabolites in the tissues of turkeys treated with ethion. The turkeys were confined in pens on soil sprayed with an emulsion of ethion (4 lb/gal EC) at a rate of 4, 12, and 40 lb AI/acre (4.48, 13.4, and 44.8 kg/ha). The maximum residues found in fat and skin, respectively, at 1 week after exposure were 0.022 and 0.080 ppm for the 4 lb/acre rate, 0.031 and 0.410 ppm for the 12 lb/acre rate, and 0.295 and 0.666 ppm for the 40 lb/acre rate. Small residues of ethion monooxon (0.002-0.003 ppm) were noted at 1 to 3 weeks after exposure in the skin of turkeys exposed to a rate of 40 lb/acre. No ethion dioxon was detected in any tissues. The results of this study indicate that by marketing, only the skin of treated turkeys would contain minute residues of ethion.

76-2032. Kadoum, A. M.; LaHue, D. W. (Dep. Entomol., Kansas Agric. Exp. St., Kansas State Univ., Manhattan, KS 66506). **Degradation of malathion in corn, wheat, and sorghum grain of high moisture content.** *J. Econ. Entomol.* 69(2): 205-206; 1976. (7 references)

Corn, wheat, and sorghum grains were conditioned to 15% moisture content by adding distilled water, after which they were incubated at 26.7°C for 2 weeks. The

grains were then treated with 10 ppm AI malathion and stored at 26.7°C for up to 28 days. Malathion residues in the samples were determined by electron capture gas chromatography. Analyses immediately after treatment showed that 10.1, 9.4, and 9.5 ppm AI were initially deposited on the sorghum, wheat, and corn, respectively. During the first 24 hr, 5.7%, 9.4%, and 25.7% of the residue disappeared from the sorghum, wheat, and corn, respectively. During the next 28 days, 69.1%, 63.0%, and 39.1% of the initial deposits disappeared from the corn, wheat, and sorghum, respectively. The results confirm previous observations that increased moisture content of grain enhances malathion degradation and that the rate of degradation is greater on corn and wheat than on sorghum. This data can be used to establish rates of application to grain harvested and stored under adverse moisture conditions.

76-2033. Vasavada, P. C. (Dairy Sci. Dep., Univ. Georgia, Athens, GA 30602). **Piperonylic acid degradation by soil bacteria. I. Isolation and growth studies.** *J. Environ. Sci. Health.* A(3): 213-223; 1976. (21 references)

Several bacterial strains capable of utilizing piperonylate (PPA) as the sole source of carbon and energy were isolated from soil by enrichment culture technique. Strains PP-1 and PP-2 were aerobic, gram-negative, motile rods with polar, monotrichous flagella; they produced pale, smooth, sticky, round colonies, and were designated *Pseudomonas PP-1* and *Pseudomonas PP-2*. Strain PP-4 consisted of gram positive, nonmotile rods occurring singly, in pairs, or in chains; it produced tiny, round, pinhead-like, raised opaque colonies with nondiffusible pink pigment. Optimum growth of all three isolates occurred at pH 7.4 and 30°C. Increasing PPA concentrations up to 0.1% resulted in increased growth, but higher concentrations were inhibitory. All strains could also utilize protocatechuate, *p*-hydroxybenzoate, vanillate, isovanillate, and acetate as growth substrates, but could not use *m*-hydroxybenzoate, *p*-methoxybenzoate, *m*-methoxybenzoate, or methanol as the sole source of carbon and energy for growth. All isolates oxidized PPA best at 30°C and pH 7.8 in 0.05 *M* Tris-HCl buffer. It is concluded that *Pseudomonas PP-2* provides a bacterial system where direct oxidation of PPA takes place.

76-2034. Bakke, J. E.; Price, C. E. (Metab. Radiat. Res. Lab., ARS, USDA, Fargo, ND 58102). **Metabolism of *O,O*(dimethyl- *O*-(3,5,6-trichloro- 2-pyridyl) phosphorothioate in sheep and rats and of 3,5,6-trichloro-2-pyridinol in sheep.** *J. Environ. Sci. Health.* B(1): 9-22; 1976. (6 references)

The metabolic fate of chlorpyrifos-methyl in one sheep and ten male rats and the metabolic fate of 3,5,6-trichloro-2-pyridinol in one sheep are reported. Two ewes were dosed once with 100 mg/kg of either compound, p.o. The ten male rats were given 10 mg of chlorpyrifos-methyl in 0.5 ml ethanol, p.o. Chlorpyrifos-methyl was metabolized to three major metabolites which were excreted in the urine and amounted to about 70% of the label. These metabolites were the glucuronide of 3,5,6-trichloro-2-pyridinol, *O*-methyl- *O*-(3,5,6-trichloro- 2-pyridyl) phosphorothioate, and 3,5,6-trichloro- 2-pyridinol. These latter two compounds and the parent compound were isolated from sheep feces. Sheep plasma contained the same metabolites that were found in sheep urine, and no parent compound was detected in the plasma. On examination of tissue residue levels, it was determined that the visceral fat contained the highest concentration of chlorpyrifos-methyl equivalents (11.8 ppm). The single dose of 3,5,6-trichloro- pyridinol was excreted unchanged in the feces and as the glucuronide in the urine.

76-2035. Kohli, J.; Weisgerber, I.; Klein, W.; Korte, F. (Inst. Oekol. Chem, Gesellschaft Strahlen- Umweltforsch., Munich, Germany). **Contributions to ecological chemistry, CVII. Fate of lindane-^{14}C in lettuce, endives, and soil under outdoor conditions.** *J. Environ. Sci. Health* B(1): 23-32; 1976. (5 references)

Seven successive outdoor experiments were conducted to determine the fate of lindane when applied to lettuce and endives, as an aqueous formulation of about 12 mg on 20 plants in each experiment. The plants grew for periods between 21 and 37 days, after which time between 4.5 and 13.9% of the applied radiocarbon was recovered from the plants. Weather conditions determined the conversion rate to soluble metabolites and to unextractable residues. In the summer months the radiocarbon in plants consisted of 36% soluble metabolites and 30% unextractable residues. In autumn the conversion rates were much lower. The following metabolites were identified in both plant species: a polar group consisting of a free trichlorophenol, 2,3,4,5-tetrachlorophenol, pentachlorophenol, conjugates of the latter two compounds, and unidentified water-soluble products which amounted to 35% of the radioactivity in plants cultivated in summer; and a nonpolar group consisting of a dichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,2,3,5- and/or 1,2,4,5-tetrachlorobenzene, pentachlorobenzene, hexachlorobenzene, and α-pentachlorocyclohexene, which amounted to 1% of the radioactivity in plants cultivated during the summer. The top 20 cm of soil contained about 14% of the total radioactivity applied to all plants. Soluble metabolites included free and conjugated 2,3,4,6-tetrachlorophenol, pentachlorophenol, 1,2,3-trichlorobenzene, 1,2,3,4-tetrachlorobenzene, 1,2,3,5- and/or 1,2,4,5-tetrachlorobenzene, pentachlorobenzene, hexachlorobenzene, and α-pentachlorocyclohexene.

76-2036. Vonk, J. W.; Kaars Sijpesteijn, A. (Inst. Org. Chem. TNO, Utrecht, The Netherlands). **Formation of ethylenethiourea from 5,6-dihydro- 3*H*-imidazo [2,1-c]-1,2,4-dithiazole-3-thione by microorganisms and reducing agents.** *J. Environ. Sci. Health* B(1): 33-47; 1976. (19 references)

The present report describes the formation of ethylenethiourea (ETU) and 5,6-dihydro- 3*H*-imidazo

[2,1-c]-1,2,4-dithiazole- 3-thione (DIDT) by microorganisms and reducing agents. DIDT, formerly called ethylene thiuram monosulfide, and ETU are the principal degradation products of ethylenebisdithiocarbamate fungicides under aqueous oxidative conditions. Microorganisms readily formed ETU from DIDT even after the addition of reducing compounds such as cysteine, glutathione, or ascorbic acid. The formation consisted of two steps: reduction of the S-S bond of DIDT, and subsequent release of carbon disulfide to form ETU. NADH reduced DIDT in the presence of enzyme extracts from *Pseudomonas fluorescens* or *Aspergillus niger*, or by commercial glutathione reductase or lipoamide dehydrogenase. ETU was produced as a result of this enzymatic reduction. The flavin compounds, flavin adenine dinucleotide and flavin mononucleotide, were also able to promote the reduction of DIDT by NADH. The formation of ETU directly from bisdithiocarbamates by chemical decomposition has been known for some time. The results of the present study indicate that this formation can also take place by an indirect, biochemical process via DIDT.

76-2037. Saha, J. G.; Burrage, R. H. (Chem. Biol. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario, Canada). **Residues of lindane and its metabolites in eggs, chicks, and body tissues of hen pheasants after ingestion of lindane-^{14}C via treated wheat seed or gelatin capsules.** *J. Environ. Sci. Health* B11(1): 67-93; 1976. (21 references)

A study was made of the contamination of pheasants, their eggs, and chicks with residues used as seed dressings for control of wireworms in cereal crops. One group of laying hen pheasants was fed 20 mg lindane-^{14}C in gelatin capsules while another was fed wheat seed treated with 100 ppm of lindane-^{14}C for 15 days. ^{14}C-labeled residues in eggs increased sharply in the capsule treated group and reached an average maximum of about 19 ppm in 8 days. This level decreased to less than 0.5 ppm in about 50 days. Residues in hatched chicks were considerably lower than in the eggs. The highest concentrations of residues occurred in fatty tissues which decreased to nondetectable levels in 6 months time. Several chlorobenzene metabolites were identified in egg yolk and chick tissues. Chlorophenolic metabolites were indicated only in chicks.

76-2038. Kapoor, S. K.; Kalra, R. L. (Dep. Entomol., Punjab Agric. Univ., Ludhiana, India). **Uptake and metabolism of carbofuran in maize plants.** *J. Food Sci. Technol. (Mysore)* 12(5): 227-230; 1975. (17 references)

Seeds of *Zea mays* L. were treated with Furadan 50% S.P. at rates of 5 and 10 g a.i./100 g. The seeds were planted, and 29 days after germination, carbofuran granules (Furadan 3G) were applied to the soil at 1.5 kg a.i./ha. Plants at different stages of growth and the grain at harvest were sampled and analyzed for pesticide residues. In the plants, the major metabolite was 3-hydroxycarbofuran, which constituted 50-80% of the total carbamates recovered. The presence of 7-hydroxyphenols of 3-hydroxycarbofuran, carbofuran, and 3-oxocarbofuran as conjugates was also indicated. The maximum carbamate levels in the plants were reached 11 days after germination. In all cases, the combined carbofuran and 3-hydroxycarbofuran residues were less than the tolerance limit of 0.5 ppm within 50-57 days after sowing. The residue levels were also below tolerance limits in the matured grains.

76-2039. Hansen, C. R., Jr.; Kawatski, J. A. (Dep. Biol., Viterbo Coll., La Crosse, WI 54601). **Application of 24-hour postexposure observation to acute toxicity studies with invertebrates.** *J. Fish. Res. Bd. Can.* 33(5): 1198-1201; 1976. (10 references)

Experimentation with carbaryl, dieldrin, endothall, malathion, and TFM (3-trifluoromethyl-4-nitrophenol) on the ostracod *Cypretta kawatai* and the midge *Chironomus tentans* demonstrated that the method of routine toxicity tests with invertebrates can be substantially improved by including a posttreatment (toxicant-free water) observation period. This improvement enables confirmation of death and thereby reveals latent toxicity or recovery. (Author abstract by permission)

76-2040. Deshmukh, V. A.; Shrikhande, J. G. (Coll. Agric., Nagpur, Maharashtra, India). **Effect of pre- and post-emergence treatment of herbicides on soil microflora and two microbial processes.** *J. Indian Soc. Soil Sci.* 22(1): 36-42; 1974. (17 references)

The effect was studied of some herbicides applied through pre- and post-emergence treatments on soil microflora, ammonification, and nitrification in the soil. The herbicides tested included 2,4-D, NaTA (sodium salt of trichloroacetic acid, TCA), simazine, atrazine, and bladex (cyanazine). The chemicals were applied at their normal rates, and each treatment was given 4 times. Samples of soil were taken on days 10, 20, and 40 following herbicide application. The herbicides had no effect on bacterial flora with the exception of bladex, an ester of 2,4-D, which inhibited bacteria in the pre-emergence treatment during the first 10 days. Actinomycetes were adversely affected in post-emergence treatments by all insecticides except 2,4-D during the first 10 days. All toxic effects subsequently disappeared. The population remained unaffected in pre-emergence applications. All herbicides with the exception of 2,4-D in post-emergence treatment depressed the fungal population. Subsequently these organisms grew normally. In post-emergence application, 2,4-D stimulated fungi growth in the first 10 days. Herbicides did not alter ammonification at all. Post-emergence application of the sodium salt of 2,4-D and trichloroacetic acid stimulated nitrification, whereas ester of 2,4-D inhibited the same during the 10 days incubation. Subsequently, there was no effect on nitrification by the herbicides. Pre-emergence treatment with herbicides did not influence this microbial process in any way.

76-2041. Deshmukh, V. A.; Shrikhande, J. G. (Coll. Agric., Nagpur, Maharashtra, India). **Effect of some herbicides on soil microflora.** *J. Indian Soc. Soil Sci.* 22(4): 300-303; 1974. (7 references)

The effect of some herbicides was studied on the microflora in two Nagpur soils. Soils used were red soil of Telankheri, Nagpur and black cotton soil of the Agricultural College Farm, Nagpur. Soil samples were mixed with 1 g of groundnut cake per 150 g soil. Four herbicides were tested at field rates (L) including 2,4-D, NaTA (TCA), simazine, and bladex (cyanazine). In a second experiment the same herbicides were used at rates five times the normal field application rates (H). Bacterial population in red clay loam soil during the first week of incubation was depressed with all herbicidal treatment, whereas a similar depression was noted in the black clay soil with only 2,4-D(H), simazine(H) and bladex. 2,4-D(L) and NaTA(L) stimulated bacteria during this period in the heavy soil. During the second week, only simazine and Bladex depressed bacteria in the red soil and simazine(H) and Bladex in the black soil. Actinomycetes were stimulated in presence of herbicides during the entire incubation period. Herbicides depressed the growth of fungi in the light soil during the first week. A similar depression in the black soil was effected by 2,4-D(H), NaTA(H), and bladex. Subsequently, marked depression of fungi in the presence of herbicides was not observed.

76-2042. DeBrabander, M.; Van de Veire, R.; Aerts, F.; Geuens, S.; Hoebeke, J. (Lab. Oncol. Immunochem., Janssen Pharm. Res. Lab., 2340-Beerse, Belgium). **A new culture model facilitating rapid quantitative testing of mitotic spindle inhibition in mammalian cells.** *J. Natl. Cancer Inst.* 56(2): 357-363; 1976. (19 references)

A new culture model has been developed which facilitates both mass screening of potential anticancer drugs acting on microtubules and quantitative experiments with known antitubulins. The method has several advantages which include: the use of mammalian cells, either transformed or not; simplicity of the techniques, phase-contrast microscopy, or simple microscopy after Giemsa staining; and the ease with which the method lends itself to quantification. The model is based on the uniform multimicronucleation response induced by antitubulins in MO cells. MO is an epithelioid-type C3H mouse embryo cell line which in culture shows contact inhibition of movement and mitosis. A number of substances that have been claimed or suspected to interfere with microtubules were tested. The results showed that these substances were active with MO cells: rotenone, benomyl, methyl benzimidazol-2-yl carbamate (carbendazim), and R 17934. Tests were also conducted using thiram and lindane.

76-2043. Hoskin, F. C. G. (Biol. Dep., Illinois Inst. Technol., Chicago, IL 60616). **Distribution of diisopropyl phosphorofluoridate- hydrolyzing enzyme between sheath and axoplasm of squid giant axon.** *J. Neurochem.* 26(15): 1043-1045; 1976. (15 references)

The possible presence of diisopropyl phosphorofluoridate fluorohydrolase (DFPase) in the Schwann cell layer of the squid giant axon is explored by the use of the fluoride-sensitive electrode, a more sensitive method of investigation than was available at the time of the original discovery of the enzyme. Pairs of axons from individual squids of the species *Loligo pealei* were used for the study. The results of the study indicate that, on the average, a 'standard' 10 mg squid giant axon will hydrolyze 0.97 μmol DFP/hr, all of which will have been hydrolyzed by the 9.4 mg axoplasm in such an axon. These findings do not support the claim that DFPase is localized in the Schwann cell layer, or in any layers of the axon sheath external to the excitable membrane. The enzyme is not membrane bound. Thus, virtually all of the DFPase appears to be located in the axoplasm. This finding is not compatible with the suggested general role for DFPase as a barrier to the penetration of ChE inhibitors to the conducting membranes of nerves. It is suggested that there is a relationship of the enzyme to isethionate, 2-hydroxyethanesulfonate, the major anion of cephalopod nerve, and to inositol 1,2-cyclic phosphate.

76-2044. Preissig, S. H.; Abou-Donia, M. B. (Univ. Texas Health Sci. Cent., San Antonio, TX 78284). **The chronologic effects of leptophos on the spinal cord and sciatic nerve of hens.** *J. Neuropathol. Exp. Neurol.* 35(3): 303; 1975.

Single oral doses of 200 mg/kg of leptophos were given to 20 chickens to determine the temporal sequence of changes in the sciatic nerve, its major branches, and the spinal cord, and to correlate these findings with clinical symptoms. All chickens developed ataxia after drug administration and most that were allowed to live long enough became severely ataxic or paralyzed. Swollen axons in the cervical gray matter were the earliest cord lesions, followed by swollen axons in the white matter. The lesions progressed to degradation of myelin and axons in the white matter. The spinal cord changes were predictable and time related, and occurred in all animals. The myelin and axonal breakdowns seen in occasional fibers of the peripheral nerve were focal and sporadic. Severe peripheral nerve lesions were produced using higher doses of leptophos. It is concluded that spinal cord lesions produced with leptophos were more consistent than peripheral nerve damage and correlated better with the clinical symptoms.

76-2045. Martinez, A. J.; Taylor, J. R.; Isaacs, E.; Dyck, P. J.; Houff, S. A. (Med. Coll. Virginia, Richmond, VA). **Kepone poisoning: ultrastructure of nerves and skeletal muscles.** *J. Neuropathol. Exp. Neurol.* 35(3): 323; 1976.

Several workers in a chemical plant in Hopewell, Virginia developed a neurological disorder characterized by insidious onset of tremors, chest pain, weight loss, mental changes, arthralgia, skin rash, opsoclonus, muscle weakness, gait ataxia, incoordination, and slurred speech.

Kepone, a chlorinated insecticide, was suspected. The severity of the neurological symptoms appeared directly proportional to the dose and duration of exposure. The toxic effects of this agent are related to its ability to bond to lipids. Six skeletal muscle and 5 sural nerve biopsies were performed. The lesions consisted of: accumulation of elongated electron dense crystalloid rods and short, laminated and parallel-membraneous bodies within Schwann cell cytoplasm; redundant Schwann cell cytoplasmic folds; prominent collagen pockets; focal degeneration of axon cylinders containing condensed neurofilaments, neurotobules, and dense bodies; occasional demyelinated axons; and vacuolization of nonmyelinated fibers. The predominance of involvement of nonmyelinated and smaller myelinated fibers with relative sparing of the larger myelinated fibers may explain the clinical symptomatology, as well as the electrophysiologic and electromyographic features.

76-2046. Robinson, C. P.; Smith, P. W.; McConnell, J. K.; Endecott, B. R. (Coll. Pharm., Univ. Oklahoma, Norman, OK 73069). **Comparison of protective effects of ethylestrenol, norbolethone, and spironolactone against lethality from acute doses of parathion and paraoxon in female rats.** *J. Pharm. Sci.* 65(4): 595-596; 1976. (6 references)

Two hundred twenty-two female Holtzman rats were given 10 mg of ethylestrenol, norbolethone, or spironolactone in water by gastric tube twice daily for 3 days and once on the fourth. Two to four hr after the last dose, parathion or paraoxon was administered ip. The steroids afforded protection against parathion in the following order of effectiveness: ethylestrenol > norbolethone = spironolactone. Ethylestrenol afforded greater protection against paraoxon lethality than norbolethone, while spironolactone offered no protection. Ethylestrenol and norbolethone were more effective against parathion lethality than against paraoxon lethality. This finding indicates that enzymes which inactivate both parathion and its active metabolite paraoxon are being induced if an increased rate of metabolism alone is involved in the protective effects.

76-2047. Amir, D.; Lavon, U. (Div. Animal Reprod., Agr. Res. Org., Volcani Cent., Bet Dagan, Israel). **Changes in total nitrogen, lipoproteins and amino acids in epididymal and ejaculated spermatozoa of bulls treated orally with ethylene dibromide.** *J. Reprod. Fert.* 47(1): 73-76; 1976. (17 references)

A study was made of the effects of administering ethylene dibromide (EDB) to bulls on the total nitrogen, lipoproteins, and amino acids of epididymal and ejaculated spermatozoa. The bulls were treated orally on alternate days with a total of ten EDB doses (each at 4 mg/kg). Microscopic examinations were performed on sperm smears, prepared from the epididymal spermatozoa collected 1 day after the last oral dose. In one of the young treated bulls 70% and 15% of the spermatozoa in the caput and cauda epididymidis, respectively, three had abnormally shaped heads, but values for the other 3 young bulls were near those of control animals. However, the ejaculates of the 3 old bulls collected 6 to 9 days after the treatment contained 100% spermatozoa with misshapen heads, and by 9 to 13 days, most of them showed degenerative changes. EDB treatment did not significantly change the total nitrogen, amino acid, or lipoprotein content of the epididymal and ejaculated spermatozoa. The amino acid composition of the proteins of spermatozoa from the epididymis and the ejaculates was changed, but these changes were significant only for the percent of isoleucine and tyrosine in the caput spermatozoa, of arginine and glycine in the cauda spermatozoa, and of proline in the ejaculated spermatozoa. EDB caused significant changes in the relative concentration of some amino acids in the lipoproteins only in the ejaculated spermatozoa; there was an increase in the percent of half-cystine and tyrosine and a decrease in the percent of threonine, serine, glutamic acid, and isoleucine.

76-2048. Kohli, K. K.; Sharma, S. C.; Bhatia, S. C.; Venkitasubramanian, T. A. (Dep. Biochem., Vallabhbhai Patel Chest Inst., Univ. Delhi, Delhi 110007, India). **Biochemical effects of chlorinated insecticides: DDT and dieldrin.** *J. Sci. Ind. Res.* 34(8): 462-470; 1975. (138 references)

Biochemical mechanisms of action of chlorinated pesticides are reviewed. The review covers the areas of carbohydrate metabolism, lipid metabolism, nucleic acid and protein biosynthesis, effects on the central nervous system, oxidases and drug metabolism, clinical enzymes, nutritional interactions, and hormones. While the effects of chlorinated insecticides can be summarized, it is difficult to assess their mode of action or the chain of events which follows their use, as studies have been conducted on different animal species. Interpretation of data is difficult. However, it is suggested that these compounds stimulate protein biosynthesis, thus affecting the enzymes of general metabolism and mixed function oxidases. In general insecticides enhance gluconeogenesis in liver and kidney. Dieldrin also increases the activity of the hexose monophosphate shunt pathway. Insecticide effects are more pronounced in animals fed low protein diets. DDT decreases the vitamin A content of the liver, and has estrogen-like activity. It also induces the degradation of steroid hormones through induction of hepatic metabolism. The plasma corticosterone level has also been noted to increase.

76-2049. Fishbein, L. (Natl. Cent. Toxicol. Res., Jefferson, AR). **Environmental health aspects of fungicides. I. Dithiocarbamates.** *J. Toxicol. Environ. Health* 1(5): 713-735; 1976. (103 references)

This review highlights the salient chemical and toxicological features (primarily carcinogenic, teratogenic, and mutagenic) of a number of the principal

dithiocarbamate fungicides. Their important trace impurities and/or metabolic and degradation products, their use patterns, and residues, as well as the germane aspects of their acute toxicity and effects on growth are also considered. The compounds discussed include: ethylene bis(dithiocarbamates) such as maneb, zineb, and nabam; dithiocarbamates such as ferbam and ziram; and thiuram disulfate, thiram, and ethylene thiourea.

76-2050. Smith, R. M.; Cunningham, W. L. Jr.; Van Gelder, G. A.; Karas, G. G. (Behavioral Toxicol. Lab., Cent. Diagnostic Lab., Iowa State Univ., Ames, IA). **Dieldrin toxicity and successive discrimination reversal in squirrel monkeys (*Saimiri sciureus*).** *J. Toxicol. Environ. Health* 1(5): 737-747; 1976. (25 references)

A study was made of behavioral responses to dieldrin exposure at very low dose levels (0.10 and 0.01 mg/kg/day). Twelve male squirrel monkeys (*Saimiri sciureus*) were used. After 55 days of exposure dose assignments were shifted and continued for an additional 54 days. The higher dose group was shifted to zero exposure and the lower dose group was shifted to high-dose exposure. The monkeys were presented with a visual nonspatial successive discrimination reversal task. During the first 55 days control and low-dose monkeys learned the task; high-dose monkeys did not. During the time after the shift in exposure levels, all groups' performances remained at the approximate level achieved at the end of the preshift period. From these results it was concluded that the high dose disrupted learning acquisition. This may be attributed to disruption of hippocampal activity. The low dose had no effect on task acquisition or maintenance.

76-2051. Morton, D. M.; Hoffman, D. G. (Toxicol. Div., Lilly Res. Lab., Div. Eli Lilly and Co., Greenfield, IN.). **Metabolism of a new herbicide, tebuthiuron (1-[5-(1,1-dimethylethyl- 1,3,4-triadiazol -2-yl]-1,3- dimethylurea), in mouse, rat, rabbit, dog, duck, and fish.** *J. Toxicol. Environ. Health* 1(5): 757-768; 1976. (8 references)

Metabolism and excretion of EL-103 (tebuthiuron) were studied after administration to mice, rats, dogs, rabbits, ducks, and fish. The compound as a solution in water or as a suspension in 5% (w/v) acacia was dosed at 10 mg/kg to mice, rats, rabbits, and ducks by gavage. Dogs were given the compound to swallow in gelatin capsules. For metabolism studies in fish, the compound was dissolved in 15 ml of methanol and mixed with 15 liters of water in aquaria to a final concentration of 25 ppm. EL-103 was readily absorbed p.o. in rats, dogs, rabbits, and ducks after single doses of 10 mg/kg, with less than 3% of the dose excreted in the feces within 96 hr. In the mouse about 30% was excreted into the feces. EL-103 was extensively metabolized and the metabolites were rapidly excreted in the urine of each species. These results preclude any binding or accumulation of EL-103 or its metabolites in the animals and are consistent with the low order of toxicity noted in lab animals and fish. *N*-demethylation at the 3-position of the urea side chain was a major route of metabolism in the mouse and rat, whereas *N*-demethylation at the 1-position of the urea was the major route in the duck. In fish, *N*-demethylation at the 3-position of the urea side chain was the only pathway noted.

76-2052. Watanabe, P. G.; Sharma, R. P. (Dep. Vet. Sci., Utah State Univ., Logan, UT). **Lymphatic tissue response in chickens treated with tri-*o*-tolyl phosphate.** *J. Toxicol. Environ. Health* 1(5): 777-786; 1976. (20 references)

A study was made of the neurotoxicity of organophosphates with particular attention to the possible implications of immune response in this respect. TOTP (TOCP) was administered by crop intubation at a dose of 0.8 g/kg, which is approximately twice the ED95 for production of paralysis. Healthy White Leghorn hens were used. Liver and spleen showed a consistent and definite increase in diffuse lymphatic tissue in TOTP-treated animals. Total plasma protein levels were increased from 7 to 20% over 4-14 days after TOTP administration. A similar increased pattern was noted in γ-globulin:albumin ratios in the treated group. The results of this study, although suggestive of immunologic stimulation in the chicken, do not indicate the presence of any specific antibody in plasma or other organs. It is not known whether any antibodies are produced against TOTP or some TOTP-modified tissue protein.

76-2053. Schein, L. G.; Thomas, J. A. (Dept. Pharmacol., West Virginia Med. Cen., Morgantown, WV). **Dieldrin and parathion interaction in the prostate and liver of the mouse.** *J. Toxicol. Environ. Health* 1(5): 829-838; 1976. (25 references)

The combined effects of dieldrin and parathion were studied on the in vitro uptake and metabolism of radioactive testosterone by the anterior prostate gland and by the liver of the mouse. Mature male Swiss-Webster mice were used. The administration of dieldrin (1.25 mg/kg/day x 5 or 10, p.o.) and/or parathion (5.2, 2.6, or 1.3 mg/kg/day x 5 or 10, p.o.) caused significant alterations in the metabolism of [1,2-^{3}H]testosterone by the anterior prostate gland and by the hepatic microsomal enzyme system in the mouse. Treatment for 5 days with parathion, followed by another 5-day treatment with dieldrin, caused significant increases in the levels of [^{3}H]androstanediol and [^{3}H]androstenedione formed by the prostate gland in vitro. At the same time, significant increases were noted in hepatic 7α- and 6β-testosterone hydroxylase activities in animals treated with parathion followed by dieldrin administration. These findings suggest that the administration of parathion or dieldrin causes changes in the metabolism of male sex hormones in the mouse liver and sex accessory organs. Also, simultaneous treatment with parathion and dieldrin resulted in

an interaction which can alter the biologic effects of either compound.

76-2054. Mel'nikov, N. N. (All-Union Sci. Res. Inst. Chem. Plant Protect., USSR). **Pestitsidy i okruzhayushchaya sreda: soedineniya mysh'yaka. [Pesticides and the environment: arsenical compounds.]** *Khim. Sel'sk. Khoz.* 13(10): 791-793; 1975. (22 references) (Russian)

The use of inorganic and organic arsenical compounds and their adverse effects on the environment are evaluated. The gradual accumulation of organic compounds in organisms is discussed, as well as their conversion into inorganic compounds. Monomethylarsenic acid salt (10 mg/kg) was given to cattle for 10 days. Examination of the liver revealed 27-64 mg/kg monomethylarsenic acid. Both monomethylarsenic and cacodylic acids were present in the urine of persons contacting these preparations. A study of crops cultivated in soil treated with 9 kg methylarsenic nitrite every year for 4 yr revealed the following: 5.2 mg/kg arsenical compounds (cotton), 4.5 mg/kg (soybeans), 2.3 mg/kg (sorghum grains), and 2.4 mg/kg (corn). These studies indicate that organic arsenical compounds must be used very cautiously in agriculture.

76-2055. Martens, R. (Inst. Bodenbiol., Forschungsanst. Landwirtsch., Braunschweig-Voelkenrode, Germany). **Reaktionstypen beim mikrobiellen Abbau von Pestiziden. [Types of reactions involved in the microbial degradation of pesticides.]** *Landbauforsch. Voelkenrode, Sonderh.* 14: 93-98; 1972. (7 references) (German)

Studies on the microbial metabolism and degradation of pesticides in the soil are reviewed. Hydrolysis, oxidation (e.g., β-oxidation, *N*- and *O*-dealkylation, thioether oxidation, epoxidation, ring hydroxylation with ring cleavage), and dehalogenation (e.g., reductive dechlorination, dehydrohalogenation, hydrolytic dehalogenation) are the principal reactions involved in the microbial degradation of pesticides in the soil. Partial replacement of the H atoms on the non-chlorinated ring of dieldrin by hydroxyl or carboxyl groups was observed in the presence of certain microorganisms. Experiments with ^{14}C-labeled dieldrin in soil revealed a labeled carbon dioxide production rate of 0.2-2% in several weeks. Dieldrin was metabolized to unidentified hydrophilic metabolites at a rate of 23% in 14 days. Endosulfan was metabolized at high rates to endodiol and endosulfate. Lindane was partially metabolized by soil microorganisms to γ-pentachlorocyclohexene, while labeled CO_2 was produced at a rate of 0.7% only. The percentage of α-isomer increased to 20-40%. The experiments indicate the possibility of ring cleavage in lindane.

76-2056. Roberts, D. (Dep. Zool., Queen's Univ., Belfast, BT7 1NN, Northern Ireland). **Sub-lethal effects of chlorinated hydrocarbons on bivalves.** *Mar. Pollut. Bull.* 6(2): 20-24; 1975. (14 references)

Certain effects of pesticides on specific features of bivalve behavior and physiology may be useful indicators of pollutant toxicity. These include the effect of pesticides on oxygen consumption of *Pecten maximus* and *Mytilus edulis*, on the contraction of isolated ventricles of *Mya arenaria*, and on burrowing behavior in *Cerastoderma edule*. At endosulfan concentrations up to and including 1 mg/l the oxygen consumption behavior of scallops was apparently normal in that the values remained open and the animals were actively filtering water. At concentrations above this level, however, the valves remained closed for increasingly longer, probably a major factor in reducing oxygen demand. DDT (0.05 mg/l) reduced the amplitude of *Mya arenaria* ventricular contraction within 4 min. The immediate response to DDT at 0.5 mg/l was cessation of ventricular contraction followed by intermittent beating interrupted by short periods of ventricular arrest. At 1.0 mg DDT/l, after a brief increase in amplitude, ventricular contraction ceased, but on return to clean seawater recovery was immediate. Dieldrin (HEOD) at 1 mg/l caused a gradual suppression of ventricular activity. Both isomers of endosulfan (0.2 mg/l) caused ventricular arrest within 2 min. Recovery was slow. Effects of these chemicals on burrowing are also reported.

76-2057. Truchlinski, J.; Jablonski, L. (Inst. Nutr. Anim. Hyg., AR Lublin, Poland). **Badania nad wplywem wybranych pestycydow fosforoorganicznych na funkcje komorek fibroblastow ludzkich w hodowli in vitro. I. Badania nad dzialaniem foschloru. [Effect of some organophosphorus pesticides on function of human fibroblasts in vitro. I. Studies on foschlor action.]** *Med. Dosw. Mikrobiol.* 27(4): 397-404; 1975. (17 references)

The effects of foschlor (trichlorfon) on human fibroblasts were studied in vitro. Foschlor doses of 100, 50, 25, and 12.5 μg/ml of Parker medium (199) were used for the studies. Doses of 100 and 50 μg/ml induced rapid degeneration of cells and inhibited glucose and α-amino N uptake by cells, as measured by the disappearance from the medium. The doses of 25 and 12.5 μg stimulated glucose uptake, and partly stimulated alpha-amino N uptake by the fibroblasts. After the dose of 25 μg, cell degeneration was delayed and much less extensive. It is suggested that this method of testing a given pesticide dose for its action on human cells in vitro may be used in functional studies on cells subjected to toxic effects of foschlor.

76-2058. Truchlinski, J. (Inst. Nutr. Anim. Hyg., AR Lublin, Poland). **Badania nad wplywem wybranych pestycydow fosforoorganicznych na funkcje komorek fibroblastow ludzkich w hodowli in vitro. II. Dzialanie DDVP. [Effect of some organophosphorus pesticides on function of human fibroblasts in vitro II. The effect of DDVP.]** *Med. Dosw. Mikrobiol.* 28(1): 43-48; 1976. (7 references) (Polish)

A study was made of the cytotoxic effect of DDVP (dichlorvos) on in vitro cultured fibroblast cells from the human embryos. DDVP (50, 25, and 12.5 μg/ml of culture

fluid 199) caused inhibition of glucose and alpha-amino nitrogen assimilation by the fibroblast cells, as measured by the decrease in the amounts of both substrates in the medium. The two larger doses inhibited amino acid assimilation throughout the experiment. The 12.5 μg/ml dose caused seven day inhibition, followed by stimulation of amino acid assimilation by the cells. The fibroblast cells were not affected by a dose of 6.25 μg/ml, but slight stimulation of glucose and alpha-amino nitrogen assimilation was noted at this concentration.

76-2059. Lotti, M.; Brighenti, F. (Inst. Med. Lav., Univ. Padova, Padua, Italy). **Interazioni metaboliche in tossicologia industriale: l'induzione e l'inibizione enzimatica. [Metabolic interactions in industrial toxicology: enzyme induction and inhibition.]** *Med. Lav.* 67(1): 1-10; 1976. (79 references) (Italian)

Metabolic interactions between drugs and xenobiotics in mixed-function oxidase systems (enzyme induction and inhibition) are reviewed in terms of industrial chemicals. The mechanisms of the microsomal metabolism of lipophilic compounds and enzymatic induction-inhibition mechanisms are discussed with regard to ingestion of chemicals. The physico-chemical properties of inducers are examined. Substances which can influence microsomal activity are reviewed; these include a number of pesticides such as DDT, DDE, chlordane, aldrin, dieldrin, lindane, and heptachlor, which act as inducers, and piperonyl butoxide and organophosphates, which act as inhibitors. The possible relation between enzymes and hepatotoxicity is considered along with the direct and indirect methods of examining the process in man. Such data can be an important means of evaluating and understanding exposure to industrial toxic substances. Drugs, atmospheric pollutants, and occupational exposure interact to produce various pharmacologic and toxic effects. Certain illnesses, apparently non-occupational (e.g., diabetes), may eventually be found to have an occupational cause. Also, induction and inhibition may, under certain circumstances, affect the toxicity of a substance without influencing the serum half-life and urinary metabolites.

See also **76-1868 76-1888 76-1895 76-1909 76-2064 76-2088**

76-2060. Kothari, R. M.; Grafius, M. A.; Millar, D. B. (Lab. Phys. Biochem., Dep. Environ. Biosci., Naval Med. Res. Inst., Natl. Naval Med. Cent., Bethesda, MD 20014). **A simple and rapid chromatographic method for the immobilization of acetylcholinesterase from electric eel.** *Anal. Biochem.* 71(1): 273-280; 1976. (20 references)

Conditions were devised for the optimal and preferential adsorption of acetylcholinesterase on an IR-120 Al^{3+} column. The procedure involved conversion of IR-120 H^+ form into the Al^{3+} complex form, equilibration with 0.01 *M* Tris-HCl buffer (pH 8.0), passage of crude electric eel (*Electrophorus electricus*) enzyme extract through the column, and column washing with the same buffer to remove any loosely associated protein. Immobilized acetylcholinesterase activity was stable for at least 85 days in the wet state at 10°C, and for 180 days in the dry state at room temperature. Activity determinations in the presence of eserine sulfate, decamethonium bromide, quinidine sulfate, and butyryl thiocholine iodide suggested that the immobilized enzyme exhibited essentially the same properties as did the free enzyme. The data suggest that acetylcholinesterase immobilized on IR-120 Al^{3+} resin has the potential of being repeatedly used as an assay tool to determine the amount of acetylcholine in biological fluids. Preliminary studies indicate that a simple colorimetric enzymatic assay with pH indicators can be used for quantitative detection of pesticides and other cholinesterase inhibitors via inhibition of the immobilized enzyme, with possibilities for use as a field test.

76-2061. Kumar, N. V. N.; Visweswariah, K.; Majumder, S. K. (Infest. Control and Pestic. Discipline, Cent. Food Technol. Res. Inst., Mysore, India). **Quantification of cholinesterase inhibition on TLC for estimation of parathion.** *Agric. Biol. Chem.* 40(2): 431-432; 1976. (13 references)

In a modification of the method of Ernst and Schuring for the detection of parathion, liver homogenates from adult female Wistar rats were sprayed on thin-layer chromatographic (TLC) plates. Enzyme inhibition on the plates, producing white spots, was taken as an index of the parathion content. A colorimetric method was developed wherein a standard unit area of 1.5 cm^2 on the magenta-colored TLC plate was scraped off from three random points and collected in test tubes. The magenta color of each zone was separately extracted in ethanol and the mean absorbance at 560 nm in a spectrophotometer was taken as control where zero concentration of parathion was present. The insecticide contents obeyed Beer's Law between 1 and 40 ng; the white area increased proportionately with the concentration of each organophosphorus pesticide on the plate.

76-2062. Masud, S. Z. (Author address not given). **Recovery of multiple residues of organophosphorus insecticides from potato tubers under laboratory conditions.** *Agric. Pakistan* 25(3): 177-183; 1974. (10 references)

As part of an investigation into insecticide residues on fruits and vegetables, methods were developed for extraction, cleanup, and gas chromatographic determination of multiple residues of phorate, diazinon, and fenitrothion in potatoes. Experiments were conducted at levels of 10, 5, 1, and 0.5 ppm for each of the insecticides. A number of solvents were studied for extraction of multiple residues of phorate, diazinon, and fenitrothion, but 10% acetone in benzene was the most suitable as it gave maximum recoveries of the three insecticides. Several solvent systems were studied for the selective elution of insecticides from Florisil but 6% or 15% ether in petroleum ether was the most satisfactory. For residue determination, electron capture gas chromatography was used. Recoveries of phorate and diazinon from fortified samples were 90% or more. For fenitrothion, low recoveries were obtained at levels and diazinon and 5 ppm for fenitrothion.

76-2063. Blair, A. (Safety Ind. Hyg., Boeing Aerospace Co., Seattle, WA 98124). **Dichlorvos accumulation on a damp surface.** *Am. Ind. Hyg. Assoc. J.* 37(4): 250-251; 1976.

Dichlorvos was collected on filter paper dampened with deionized water. The dampened papers were placed in watch glasses on the plate of an exposure desiccator, which was connected to the effluent stream from a vapor exposure chamber. After 40 min the test chamber was disconnected from the vapor exposure chamber and connected to a control chamber (no dichlorvos); clean air was allowed to pass through the test chamber for 2-16 hr. The papers were then extracted with deionized water and analyzed for dichlorvos using chromatographic techniques. Samples were removed and replaced in such a fashion that from one to nine exposure cycles were obtained. The results indicated that dichlorvos tends to accumulate linearly on damp surfaces with repetitious exposure. This accumulation occurred even when the surfaces were given ample time to dry between exposures. Dichlorvos also accumulated in a nearly linear fashion within a beaker of water placed in the test chamber; the water volume in the beaker was maintained constant.

76-2064. Southwick, L. M.; Willis, G. H.; Dasgupta, F. K.; Keszthelyi, C. P. (Agric. Res. Serv., Univ. Station, Baton Rouge, LA 70803). **The polarographic reduction of some dinitroaniline herbicides.** *Anal. Chim. Acta* 82: 29-35; 1976. (17 references)

The newness and widespread application of the dinitroaniline herbicides prompted this study of the polarographic reduction of such compounds. Polarography of 2,6-dinitroaniline herbicides in aqueous ethanol revealed a marked pH dependence of the reduction potentials. The herbicides studied included trifluralin (I), benefin (II), isopropalin (III), dinitramine (IV), nitralin (V), and oryzalin (VI), for which half-wave potential values (mV vs. SCE) for the first polarographic wave, at pH 1.5, 5.1, 7.4, and 9.2, resp., were (I)-190,-430,-540,-640; (II)-190,-

430,-540,-640; (III)-170,-360,-560,-650; (IV)-230,-510,-720,-810; (V)-160,-330,-540,-650; (VI)-160,-370,-540,-680. The decrease noted in reduction potential with increasing pH is characteristic of the polarographic reduction of the aromatic nitro group. This study demonstrates the relative ease of reduction of these compounds and points to the feasibility, in a submerged soil situation, of a nonbiological pathway for the initial steps in the reductive degradation of the dinitroaniline herbicides.

76-2065. Ragab, M. T. H. (Agric. Canada, Res. Stn., Kentville, Nova Scotia, B4N 1J5, Canada). **Congo red as a spray reagent for the visualization of dithiocarbamate fungicides separated on thin-layer chromatograms.** *Anal. Lett.* 9(4): 295-302; 1975. (12 references)

This paper reports a modification in the application of Congo red which makes it useful for analytical determinations of dithiocarbamate fungicides. After the separation of dithiocarbamates on thin-layer chromatograms, the use of Congo red as a single spray reagent locates and identifies the dithiocarbamates. The chromatogram is sprayed once with Congo red, which stains the entire chromatogram red. While it is still wet, the chromatogram is exposed to bromine vapor in a glass tank. This causes the dithiocarbamates to appear as blue spots against a bleached background. Using a second spray of Congo red after the dissipation of bromine intensifies the blue spots and turns the background red. The blue spots are very well defined and stable if they are protected from light. The procedure is rapid and requires no heating.

76-2066. Inscoe, M. N.; Beroza, M. (Agric. Environ. Qual. Inst., U.S. Dep. Agric., Beltsville, MD). **Analysis of pheromones and other compounds controlling insect behavior.** *IN: Analytical methods for pesticides and plant growth regulators. VIII. Government regulations, pheromone analysis, additional pesticides.* Academic Press, Inc., 1976, p. 31-114. (338 references)

Much of the difficulty encountered in pheromone identifications arises from the extremely low concentrations at which these materials occur. Progress in identification of a behavior-controlling chemical depends heavily on the availability of a suitable and reliable method of bioassay. The discussion on analysis in this chapter includes information on pheromone sources, extraction, low-temperature precipitation of impurities from extract, distillation, recovery of volatiles from air, generation of additional material from precursors, and choice of method to be used. Chromatographic methods discussed include liquid chromatography on columns, thin-layer chromatography, and gas chromatography. Spectrometric methods discussed include mass spectrometry, nuclear magnetic resonance spectrometry, infrared spectrometry, ultraviolet spectrometry, and x-ray crystallography. Reaction chromatography is also considered. An electroantennogram method for finding sex attractants is presented. Methods considered under trace analysis include radiolabeled materials.

76-2067. Anonymous. **Insecticides.** *IN: Analytical methods for pesticides and plant growth regulators. VIII. Government regulations, pheromone analysis, additional pesticides.* Academic Press, Inc. 1976, p. 117-248. (101 references)

In this section of the book methods are presented for formulation and residue analysis of insecticides which have not been described in earlier volumes. The insecticides treated include: allethrin, formothion, mecarbam, methidathion, phenthoate, pirimiphos-ethyl, pirimiphos-methyl, promacyl, prothoate, pyrethrum, and thiometon.

76-2068. Anonymous. **Fungicides.** *IN: Analytical methods for pesticides and plant growth regulators. VIII. Government regulations, pheromone analysis, additional pesticides.* Academic Press, Inc., 1976, p. 251-331. (52 references)

In this section of the book methods are presented for formulation and residue analyses for fungicides which have not been described in earlier volumes. The fungicides treated include: 2-aminobutane, chlorothalonil, dinobuton, ethirimol, mertect, validacin, and vitavax (carboxin).

76-2069. Anonymous. **Herbicides.** *IN: Analytical methods for pesticides and plant growth regulators. VIII. Government regulations, pheromone analysis, additional pesticides.* Academic Press, Inc., 1976, p. 335-471. (76 references)

In this section of the book methods are presented for formulation and residue analyses for herbicides which have not been described in earlier volumes. The herbicides treated include: balan (benefin), devrinol, dinitramine, isopropalin, karbutilate, MCPB, metoxuron, oryzalin, pronamide, and sencor (metribuzin).

76-2070. Anonymous. **Growth regulators and miscellaneous pesticides.** *IN: Analytical methods for pesticides and plant growth regulators. VIII. Government regulations, pheromone analysis, additional pesticides.* Academic Press, Inc., 1976, p. 475-494. (2 references)

Methods for formulation and residue analyses are presented for ancymidol, a plant growth regulator which reduces internode elongation; for Protect, a chemical used as a corn seed treatment to protect corn from herbicidal injury by thiocarbamate herbicides; and for succinic acid 2,2-dimethylhydrazide.

76-2071. Goursaud, J.; Luquet, F.; Casalis, J. (Lab. Ind. Lait., Douai, France). **Methode de dosage des residus**

d'hexachlorobenzene, de pentachloronitrobenzene, et de pentachloroaniline dans les laits. [Method for measuring hexachlorobenzene, pentachloronitrobenzene, and pentachloroaniline residues in milk products.] *Ann. Fals. Expert. Chim.* 69(739): 327-336; 1976. (6 references) (French)

A technique for hexachlorobenzene (HCB) determination comprises extracting the fatty substance from the milk, fractionating the pesticides and the lipids by liquid chromatography on a florisil column, and determining each pesticide qualitatively and quantitatively by gas chromatography with an electron capture detector. It allows recovery of about 80% of the initial HCB, PCNB, and PCA residues. PCNB and PCA are rarely present simultaneously at comparable doses. As a rule, when PCA is present at average concentrations, PCNB will rarely be found and always at lower concentrations, and vice versa. Most chlorinated insecticides can also be satisfactorily determined, except for dieldrin because of the weak hydration of florisil at 3%. With two columns at different polarities, the following pesticides can be analyzed quantitatively and qualitatively in a mixture: HCB, PCNB, α-, β-, and γ-BHC, HEOD (dieldrin), DDE, DDD (TDE), and DDT.

76-2072. Mestres, R.; Tourte, J.; Campo, M.; Illes, S. (Lab. Chim. Appl. Expert., Fac. Pharm., Montpellier, France). **Note complementaire sur le dosage des residus de thiabendazole dans les agrumes et les bananes. [Additional note on the measurement of thiabendazole residues in citrus fruits and bananas.]** *Ann. Fals. Expert. Chim.* 69(739): 369-370; 1976. (French)

In a previously described spectrophotometric method of analysis interfering substances appeared between 250 and 320 nm during the determination of thiabendazole residues in lemons and bananas. This problem was found to be caused by the ammonia added during extraction regardless of pH. It is thus recommended that the acidity of the medium be offset by the addition of 1 or 2 ml of sodium hydroxide, d= 1.33.

76-2073. Matsumoto, M. (Kyoto Municipal Inst. Publ. Health, Kyoto, Japan). **[A method of rapidly determining polychlorobiphenyl and organochlorine pesticides.]** *Kyoto-Shi Eisei Kenkyusho Eiken Nenpo Annu. Rep. Kyoto Munic. Inst. Public Health* 41: 43-44; 1975. (Japanese)

In order to minimize the kinds and amounts of solvents, reagents, and apparatus used, and especially to accomplish the removal of fats and the use of column chromatography in a single step, methods were studied for determining PCB and organochlorine pesticides. The resulting method first requires fat removal with a hexane-acetone mixture from specimens of animal origin with a cylindrical mixer. Acetone was removed with water from the extract, and column chromatographic clean-up and separation were done on silica gel containing 6% water and Celite containing 50% sulfuric acid. The columns were eluted with hexane, followed by hexane containing 30% acetone. The resulting fraction I contained PCB and *p,p'*-DDE; fraction II contained *p,p'*-DDT, *p,p'*-DDD (TDE), and BHC isomers. Hexane solutions of specimens containing dieldrin and endrin were treated with 1 *M* KOH and extracted with hexane. The hexane layer was cleaned up on hydrated silica gel, then eluted first with hexane, followed by hexane containing ether. Fraction I' contained PCB, *p,p'*-DDE, and aldrin, and fraction II contained dieldrin and endrin.

76-2074. Kirchner, K.; Berge, H. (Bezirksinst. Veterinaerwesen, DDR-20 Neubrandenburg, DDR). **Bestimmung von Methyl-Parathion (*O,O*-Dimethyl- (*p*-nitrophenyl)- thiophosphorsaeureester) und Metaboliten in tierischem Material und in Futtermitteln. [Determination of methyl parathion and its metabolites in samples from animals and in foodstuffs.]** *Arch. Exp. Veterinaermed.* 29(5): 643-649; 1975. (5 references) (German)

A new thin-layer chromatographic method was developed for the detection of methyl parathion and its metabolite, methyl paraoxon, and their degradation product *p*-nitrophenol. Extraction from homogenized and acidified samples of animal organs and foodstuffs is done with a chloroform-methanol mixture at a ratio of 9:1. The sample is applied to a silica gel G layer, after which development is done twice with benzene-acetone in a 9:1 ratio. For visualization, the plate is sprayed with an aqueous zinc chloride solution with hydrochloric acid, aqueous sodium nitrite solution, and *N*-(1-naphthyl) ethylenediamine (Bratton-Marshall reagent) in alcohol. After coupling with this reagent, the blue-violet spots of methyl parathion and methyl paraoxon develop immediately, and the blue spots of *p*-nitrophenol appear in 1-3 hours, depending on the concentration. Evaluation is best done 15-20 hours after spraying. The limits of detection are 2 ppm for methyl parathion and methyl paraoxon and 4 ppm for *p*-nitrophenol.

76-2075. Kirchner, K.; Berge, H. (Bezirksinst. Veterinaerwesen, DDR-20 Nenbrandenburg, DDR). **TAS-Verfahren zum Nachweis von Methyl-parathion (*O,O*-Dimethyl- (*p*-nitrophenyl)- thiophosphorsaeureester) und einigen Umwandlungsprodukten in organischem Material. [TAS method for the detection of parathion-methyl and some transformation products in organic substances.]** *Arch. Exp. Veterinaermed.* 29(5): 649-653; 1975. (11 references)

Methyl parathion, methyl paraoxon, and *p*-nitrophenol were determined in samples of animal origin and foodstuffs by a simplified thermal analysis procedure. The substances were isolated by thermomicropartition in the thermal analysis oven, with immediate uptake of the condensate on thin-layer plates. Identification was performed directly from the sample or from the residue of a crude extract. After thin-layer chromatographic partitioning, the compounds were made visible by coupling with

suitable amines. Using this thermal analysis method it was possible to detect 2 to 4 ppm methyl parathion and methyl paraoxon, or 3 to 4 ppm *p*-nitrophenol directly from samples, or 0.05 to 0.10 ppm of the first two compounds and 0.1 to 0.5 ppm of *p*-nitrophenol in the residue of extracts.

76-2076. Cole, E. R.; Bachmann, F. (Coagulation Res. Lab., Hematol. Sect., Dep. Med., Rush-Presbyterian-St. Luke's Med. Cent., Chicago, IL). **Spectrophotometric assays for warfarin sodium and dicumarol.** *Arch. Intern. Med.* 136(4): 474-479; 1976. (20 references)

The usefulness of spectrophotometric assays of plasma or serum extracts in the rapid identification and determination of dicumarol and warfarin sodium levels was documented in five cases. The patients included a 65-yr-old man who accidentally took dicumarol for several weeks and developed an acute condition within the abdomen, a 28-yr-old man who ingested 500 mg of warfarin sodium in a suicide attempt, a 26-yr-old malingering nurse who surreptitiously took dicumarol, a 29-yr-old nurse with warfarin intoxication who did not follow a dosage prescription because of fear of developing thrombosis, and a 37-yr-old woman with calf vein thrombosis who did not ingest the administered warfarin sodium because of fear of developing bleeding. In each case, the diagnosis of surreptitious ingestion or noningestion was suspected on the basis of the coagulation profile pattern. Confirmation of the disorder by the spectrophotometric assay enabled the clinician to choose the appropriate course of action with speed and purpose.

76-2077. Pigati, P. (Natl. Res. Cent., Sao Paulo, Brazil). **Metodos biologicos para a determinacao de residuos de insecticidas. [Biological methods for determining insecticide residues.]** *Biologico* 39(7): 189-191; 1973. (Portuguese)

Commonly used test animals for biological determination of insecticide residues are the fruit fly (*Drosophila melanogaster*) and mosquito larvae. For almost 20 years the Biological Institute has run tests with fruit flies and the larvae of *Culex pipiens fatigans* Wied, and has used enzymatic methods of determining residues in the soil and in various vegetable tissues. Biological test methods usually require adequate sampling, extraction, and clean-up. Extraction solvents with a high boiling point should be avoided. Clean-up methods should avoid the introduction of other factors that would be toxic to the test organism; in some cases clean-up may be omitted. Direct exposure, the film method, the aqueous solution method, cholinesterase inhibition, the potentiometric method, and extraction-purification methods are various approaches used in biological testing.

76-2078. Piedade, J. R.; Matsunaga, A. K.; Vasques, R. M. P.; Yoneda, H. (Chem. Dep., Biol. Inst., Sao Paulo, Brazil). **Comparacao entre padronizacao interna e externa na analise por cromatografia de gas. [Comparison between internal and external standardization in gas chromatographic analysis.]** *Biologico* 40(4): 123-124; 1975. (6 references) (Portuguese)

In an analytical chemistry study carried out by gas chromatography the internal method of standardization (a known amount of the standard is added to the sample before the analysis) was compared to the external method (standard and sample are analyzed separately). Both methods were evaluated by the weight-area relationship in 22 standard samples of thiocarbamate compounds used as herbicides: Eptam (EPTC), Ordram (molinate), Ro-neet (cycloate), Sutan (butylate), Tillam (pebulate), and Vernam (vernolate). All compounds were either in granular form or concentrated emulsions. The tabulated results showed sufficient similarity between the two methods; the internal standarization method gave five results which were not within the the tolerance limits established by the FAO vs. three discordant results obtained with the external methods. It is concluded that due to its slightly superior accuracy and shorter duration the external method of standardization is to be preferred.

76-2079. Pardue, J. R.; Ribas, C.; Williams, B. (Food Drug Admin., Atlanta, GA). **Comportamento analitico de diversos defensivos agricolas organofosforados atraves do methodo de R.W. Storherr, P. Ott e R. R. Watts. [The determination of some organophosphorus pesticides by the method of R.W. Storherr, P. Ott and R. R. Watts.]** *Biologico* 40(5): 150-155; 1974. (4 references) (Portuguese)

The method of R. W. Storherr et al. for the analysis of organophosphorus pesticide residues in nonfatty foods was evaluated by determining the analytical behavior of methidathion, tetrachlorvinphos, acephate, phosvel, phosvel oxygen analog, and bensulide. The determinations were carried out by gas chromatography using apparatus equipped with either a thermionic-potassium chloride (ThD-KCl) detector or a flame photometric detector (FPD), calibrated in such manner that 2.0 ng of parathion will register a peak height with a value of 50% of full scale deflection. Three types of column (10% DC-200 used with ThD-KCl and FPD; 15% QF-1+ 10% DC-200 used with ThD-KCl; 2% DEGS used with FPD) were used and standardized according to the retention time of carbophenothion. Recovery studies were carried out with partitioning alone or partitioning plus a charcoal column passage following dilution of the pesticide samples with 30% acetonitrile in water and subsequent extraction with dichloromethane. The compounds were determined alone or after addition to a known amount of agricultural products (cucumber, apple, or potato). The results indicated that the Storherr et al. method can be used without restrictions for the determination of residues of methidathion (98-100% recovery), tetrachlorvinphos (77-84%) and phosvel (93-97%), and possibly for acephate and bensulide, while it was not satisfactory for the phosvel oxygen analog. The erratic results obtained for acephate and bensulide appear to have been caused by the type of columns used.

76-2080. Rueppel, M. L.; Suba, L. A.; Marvel, J. T. (Agric. Res. Dep., Monsanto Co., St. Louis, MO 63166). **Derivatization of aminoalkylphosphonic acids for characterization by gas chromatography-mass spectrometry.** *Biomed. Mass Spectrometry* 3(1): 28-31; 1976. (6 references)

A general derivatization method was developed for primary and secondary aminoalkylphosphonic acids. Derivatization is effected by reaction with trifluoroacetic acid and trifluoroacetic acid anhydride followed by esterification using ethereal diazo-*n*-butane. This method can be used for microgram quantities of aminoalkylphosphonic acids and permits ready characterization by both gas chromatography and gas chromatography-mass spectrometry. In general, the *N*-butyl *N*-trifluoroacetyl (TFA) esters of the aminoalkylphosphonates examined gave single peaks when examined by gas chromatography; all but one contained two *n*-butyl groups and the data were consistent with the structural assignment as di- or tri-*n*-butyl *N*-TFA derivatives. The efficiency of derivatization in the case of both *N*-(phosphono-^{14}C-methyl) glycine and aminomethyl-^{14}C phosphonic acid was greater than 90%. Fragmentation patterns were confirmed by high resolution mass spectrometry, isotope labeling, and the formation of derivative analogs.

76-2081. Takiura, K.; Yamaji, A.; Oe, M.; Yuki, H. (Fac. Pharm. Sci., Osaka Univ., Toneyama, Toyonaka, Osaka, Japan). **[Analysis of commercial mosquito coil smoke by gas chromatography.]** *Bochu-Kagaku (Sci. Pest Contr.)* 38(1): 26-29; 1973. (12 references) (Japanese)

Gas chromatographic methods were used to analyze smoke from commercial mosquito coils. This method of analysis identified acetaldehyde, furan, propionaldehyde, acetone, acrolein, benzene, toluene, xylene, and styrene (25% PEG 6000 column). It is suggested that these compounds are pyrolytic products derived from the basic materials of mosquito coils. The smoke also contained insecticidal constituents, allethrin and pyrethrin I. Different concentrations of these insecticidal components were noted in the smoke from various commercial coils.

76-2082. Kawale, G. B.; Joglekar, V. D. (Forensic Sci. Lab., State Maharashtra, Bombay 400 008, India). **Tollen's reagent for the detection of carbamate and organophosphate insecticides.** *Current Sci.* 45(2): 57-58; 1976. (7 references)

A brief communication describes the use of Tollen's and Nessler's reagents for the detection of carbamate insecticides in cases of poisoning by these chemicals. Carbamate and organophosphate insecticides are revealed as black spots with Tollen's reagent. Organophosphate insecticides gave black spots at room temperature with Nessler's reagent, whereas carbamates gave black spots only after heating at 110°C for 10 min. With Tollen's reagent the spots appear black on a white background, thus giving better clarity of location, and they remain visible for a number of hours. The sensitivity of detection with Tollen's reagent is about 2 μg. Tollen's reagent also gives a black color with organophosphates such as Dimecron (phosphamidon) and Nuvan (dichlorvos), which do not react with mercurous nitrate. The fact that organophosphates react with Nessler's reagent and give a black color instantaneously, while the carbamates give a black color only on heating, helps in differentiating the organophosphate from the carbamate insecticides.

76-2083. Tsunenari, S. (Dept. Legal Med., Kumamoto Univ. Med. Sch., Kumamoto, Japan). **The determination of paraquat using thin-layer chromatography.** *Forensic Sci.* 5(1): 61-67; 1975. (14 references)

This paper is concerned with the use of thin-layer chromatography for the detection and determination of paraquat in biological materials such as urine, gastric contents, and feces. A microplate method of thin-layer chromatography for detecting paraquat is also presented. In this report the ion-exchange resin Dowex 50W-4 (200-400 mesh) was tested for concentrating paraquat from biological materials, by applying a batch operation. No resin preparation before use was required. Paraquat was first adsorbed with the resin, and then eluted specifically from the resin with 5 *N*-hydrochloric acid. Of the 16 solvent systems tested, the best results were obtained on silica gel G plates with methanol: 6*N* hydrochloric acid (20:30) or methanol: 6*N* sulfuric acid (20:30); and on cellulose plates with methanol: 6*N* hydrochloric acid (35:15) or methanol: 6*N* sulfuric acid (40:10).

76-2084. Katz, M. (No address given). **Intersociety Committee (ISC) methods of air sampling and analysis.** *Health Lab. Sci.* 13(1): 60-61; 72-77; 1976. (4 references)

An analytical method for the measurement of parathion in air is described. The procedure is applicable for the measurement of parathion at 0.1-2.5 times the proposed OSHA Federal Standard of 100 μg/m^3. Parathion is effectively removed and retained from an air sample by passing a measured volume through an impinger containing ethylene glycol. The ethylene glycol is diluted with water and the pesticide is extracted into hexane, after which the hexane solution is concentrated to a small volume. An aliquot of the hexane extract is then gas chromatographed and the parathion is determined as it elutes from the column by a flame photometric detector designed to measure the emissivity of phosphorus at 526 nm. The quantity of light emitted is directly proportional to the amount of phosphorus present. Phosphorus compounds having retention volumes close to that of parathion will interfere in the analysis; if interferences are anticipated, a lengthy pretreatment of the sample is required. Limited data indicates a relative standard deviation of 25% for this procedure.

76-2085. Anonymous. **Nuovo rilevatore ad altissima sensibilita e selettivita variabile (NPSD). [A new detector with**

very great and variable sensitivity and selectivity (NPSD).] *Inquinamento* 18(1): 44-47; 1976. (Italian)

The thermionic nitrogen phosphorus selective detector is widely used to determine trace residues of either phosphorus or nitrogen containing insecticides and of herbicides (triazines). Compared to the conventional flame ionization detector (FID), the NPSD has 50-100 times greater sensitivity for nitrogen compounds and 500-1,000 times greater for phosphorus compounds. The detector also lowers the response of organic compounds containing no phosphorus or nitrogen, thereby producing, in the presence of these molecules, a response selectivity of about 1,000/1 for nitrogen compounds and 10,000/1 for phosphorus compounds. The selectivity factor between nitrogen and phosphorus can be varied by changing the height of the polarization electrode above the flame. The selectivity ratio, at optimal sensitivity conditions, for phosphorus and nitrogen is 8.4. The detector can operate like an FID when the alkali source is removed from the flame. It is not sensitive to polyhalogenated pesticides at the levels at which they are usually determined; at concentrations on the order of 0.1 μg peak inversion can be obtained.

76-2086. Dedek, W. (Forschungsstelle Chem. Toxikol., Akad. Wissenschaft. DDR, Leipzig, DDR). **Radioaktive Nuklide in der Pestizid-Forschung. Teil VI: Ubersichtsarbeiten, allgemeine Analysenverfahren, Insektizide. [Radioactive nuclides in pesticides research. VI. Reviews, general analytical procedures, insecticides.]** *Isotopenpraxis* 11(11): 378-385; 1975. (541 references) (German)

This review brings to completion a literature survey series on investigations with radiolabeled insecticides covering the results published in the years from 1970 to 1974 inclusive. Experiments with labeled substrates were not included. Radiochemical analyses are gaining increasing importance in pesticide research, as they provide an optimal information content, especially in the investigation of metabolic transformation reactions. Combination of tracer analysis with other procedures such as thin-layer and gas chromatography is advantageous. Radiotracer methods are particularly indispensable for studies with water-soluble metabolites, since these are difficult to determine by GLC. Radiotracer methods eliminate time-consuming cleanup and recovery problems.

76-2087. Newsome, W. H. (Food Res. Div., Bureau Chem. Safety, Health Protect. Br., Health and Welfare Canada, Ottawa, Ontario, Canada). **A method for the determination of ethylenebis (isothiocyanate) on food crops.** *J. Agric. Food Chem.* 24(2): 420-421; 1976. (5 references)

A method was developed to permit the quantitative determination of ethylenebis (isothiocyanate) (EBI) on food crops treated with ethylenebis (dithiocarbamates). A sample of crop material was homogenized with absolute ethanol. The homogenate was filtered and the filtrate placed in a separatory funnel. After the addition of 1.0 *M* NaCl the aqueous phase was extracted with toluene. The toluene layer was shaken with a fresh portion of 1.0 *M* NaCl and then with 1.0 *M* HCl. An aliquot was passed through a small column of silica acid. A sample of effluent was analyzed by gas-liquid chromatography. Samples were analyzed on a Hewlett Packard 5700 A gas chromatograph fitted with a ^{63}Ni electron capture detector on a 6 ft x 4 mm i.d. glass column packed with 5% butanediol succinate on 100-120 mesh Chromosorb W, HP, and was preconditioned at 200°C for 48 hr in a flow of argon-methane (95:5) carrier gas. Recovery was linear with the amount of EBI added between 0.05 and 10 ppm with an overall yield of 98.3%.

76-2088. Arjmand, M.; Mumma, R. O.* (Pestic. Res. Lab., Pennsylvania State Univ., University Park, PA 16802). **Metabolism of 2,4-dichlorophenoxyacetic acid. 8. Gas-liquid chromatography of trimethylsilyl derivatives of amino acid conjugates.** *J. Agric. Food Chem.* 24(3): 574-580; 1976. (14 references)

A gas-liquid chromatographic technique was developed for the analysis of 19 metabolites of 2,4-D or potential metabolites, with particular emphasis on the amino acid conjugates of 2,4-D. This technique involves trimethylsilyl derivatization of the metabolites by hexamethyldisilazane, separation by GLC with 0V-1 and OV-17 stationary phases, and quantification with a flame ionization detector. The structures of the Me_3Si derivatives were confirmed by mass spectrometry. Preliminary studies on the practical application of this technique for the analysis of plant extracts were conducted. (Author abstract reprinted by permission of the American Chemical Society)

76-2089. Sieck, R. F.; Johnson, W. F.*; Cockerill, A. F.; Mallen, D. N. B.; Osborne, D. J.; Barton, S. J. (Lilly Res. Lab., Eli Lilly Co., Greenfield, IN 46140). **Gas chromatographic analysis of oryzalin residues in agricultural crops and soil.** *J. Agric. Food Chem.* 24(3): 617-620; 1976. (3 references)

A method is decribed for determining residues of oryzalin (trademark Surflan, Elanco Products Co., Indianapolis, Ind.) [3,5-dinitro- N^4,N^4-di(*n*-propyl) sulfanilamide] in crops and soil. The samples were extracted with methanol and cleanup was carried out by liquid-liquid partitioning and column chromatography on alumina using 95:5 benzene-ethyl acetate as eluent. Oryzalin was converted to the N^1,N^1-dimethyl derivative for measurement by gas-liquid chromatography using an electron capture detector. Recoveries of oryzalin from crops fortified at 0.05 ppm averaged 72%. Soil samples fortified at 0.1 ppm showed an average recovery of 92%. Residues as low as 0.01 ppm may be detected. (Author abstract reprinted by permission of the American Chemical Society)

76-2090. Cook, G. H.; Moore, J. C.* (Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561). **Determina-**

tion of malathion, malaoxon, and mono- and dicarboxylic acids of malathion in fish, oyster, and shrimp tissue. *J. Agric. Food Chem.* 24(3): 631-634; 1976. (12 references)

A method is described for monitoring the presence of malathion and its metabolites in the aquatic environment. Malathion, malaoxon, malathion monoacid, and malathion diacid were determined in fish, oyster, and shrimp tissues by gas-liquid chromatography (GLC) using phenthoate and phenthoate acid as internal standards. GLC analyses were performed without cleanup, using a flame photometric detector operating in the phosphorus mode. Acid compounds were methylated with diazomethane. Pinfish exposed to 75 μg/l of malathion in flowing seawater for 24 hr contained no residues of malathion or malaoxon, although the concentration of the malathion monoacid in the gut was 31.4 μg/g. The data illustrate that pinfish rapidly convert malathion to the mono- and dicarboxylic acids of malathion. (Author abstract reprinted by permission of the American Chemical Society)

76-2091. Van Peteghem, C. H.; Heyndrickx, A. M. (Dep. Toxicol., State Univ. Ghent, B-9000 Ghent, Belgium). **Gas chromatographic determination of 2,4-dichlorophenoxyacetic acid (2,4-D) by mass fragmentography with a deuterated internal standard.** *J. Agric. Food Chem.* 24(3): 635-637; 1976. (7 references)

A method for the quantitative determination of 2,4-dichlorophenoxyacetic acid (2,4-D) in urine by means of mass fragmentography is described. The deuterated methyl ester of the compound is used as the internal standard. Its molecular ion at *m/e* 237 and that of the methyl ester of 2,4-D (*m/e* 234), formed by diazomethane treatment of the extract, are selected for mass fragmentographic registration. The detector has a linear response in the 10-300 ppb and 0.3-10 ppm ranges after corrections for overlapping of the internal standard signal by the 2,4-D H_3-methyl ester signal. More reproducible results are obtained with the deuterated derivative of the compound being measured as the internal standard than with a conventional internal standard. (Author abstract reprinted by permission of the American Chemical Society)

76-2092. Hunt, L. M.; Gilbert, B. N. (U. S. Livestock Insects Lab., Agric. Res. Serv., Kerrville, TX 78028). **Micromethod for determining insect growth regulator methoprene in bovine fat.** *J. Agric. Food Chem.* 24(3): 669-670; 1976. (3 references)

A micromethod to determine methoprene (isopropyl (2*E*,4*E*)-11-methoxy- 3,7,11-trimethyl- 2,4-dodecadienoate) in 2 g of bovine fat is presented. Samples were cleaned up by elution through an acid alumina column and by high-performance liquid chromatography. Quantitation was by high-performance liquid chromatography, and confirmation was by gas-liquid chromatography. The percentage of recovery from fortified samples averaged 88% (range 84-96%). The lower limit of sensitivity is less than 0.008 ppm. (Author abstract reprinted by permission of the American Chemical Society)

76-2093. Khan, S. U.; Lee, K. S. (Chem. Biol. Res. Inst., Canada Agric., Ottawa, Ontario, Canada). **Determination of cyperquat (1-methyl-4- phenylpyridinium chloride) residues in soil by gas-liquid chromatography.** *J. Agric. Food Chem.* 24(3): 684-686; 1976. (4 references)

Catalytic hydrogenation of cyperquat (PtO_2:cyperquat, <2) resulted in the formation of 1-methyl-4- phenylpiperidine and 1-methyl-4- cyclohexylpiperidine. However, hydrogenation with an increasing amount of the catalyst (PtO_2:cyperquat, ≥2) produced only the latter compound. The development of the method for cyperquat residues in soils was based on the formation of 1-methyl-4-cyclohexylpiperidine which gave a single symmetrical gas chromatographic peak. The method involves catalytic hydrogenation of the acid extract of soil, extraction of the material into hexane, and analysis by gas-liquid chromatography. Recoveries of the herbicide added to soil at 0.5- and 1-ppm levels were 77.1 and 85.2%, respectively. The method has been used for the determination of field applied cyperquat. (Author abstract reprinted by permission of the American Chemical Society)

76-2094. Junk, G. A.; Richard, J. J.; Svec, H. J.; Fritz, J. S. (Ames Lab. E.R.D.A., Iowa State Univ., Ames, IA). **Simplified resin sorption for measuring selected contaminations.** *J. Am. Water Works Assoc.* 68(4): 218-222; 1976. (23 references)

A general resin sorption scheme for measuring the organic components in water was used to determine the concentrations of atrazine, DDE, and dieldrin in various surface, subsurface, and finished waters in Iowa. Surface waters from all major watersheds, shallow wells, and water treatment plants were contaminated; seasonal and climatic fluctuations were consistent with an agricultural runoff model. Deep wells located outside the alluvial plain of contaminated rivers were at most only slightly contaminated. Water treatment processes employed at modern treatment plant were ineffective in reducing the pesticide concentration, and significant advances in water-treatment technology may be necessary if removal of nanogram-per-liter amounts of certain potentially toxic chemicals is to be judged desirable. However, pesticide contaminated waters are negligible compared with other probable ingestions, especially aquatic foods and dairy products.

76-2095. Bontoyan, W. R. (Off. Pestic. Programs, Environ. Protect. Agency, Beltsville, MD 20705). **Report on pesticide formulations II.** *J. Assoc. Off. Anal. Chem.* 59(2): 298-299; 1976. (1 reference)

The General Referee on Pesticide Formulations II recommends that work on four topics be discontinued because of their minor economic significance, lack of need for further work, the likelihood that they will be phased out for environmental reasons, or the fact that they are being studied by another group: arsenic, mercurials, tripital, and phenmedipham. Four new Associate Referees were ap-

pointed for the following topics: pesticides in spray tank solutions resmethrin rodenticides and sampling of commercial pesticide formulations for chemical and physical analysis The General Referee's laboratory participated in a comprehensive World Health Organization study of malathion formulations, and the EPA staff at the Beltsville laboratory is completing the United States EPA Manual of Chemical Methods for Pesticides and Devices. The status of the following topics is reported: benzene hexachloride and lindane, bromoxynil, captan, dicofol, endosulfan, resmethrin, rodenticides, rotenone and other rotenoids, sampling of commercial pesticide formulations for chemical and physical testing, and toxaphene.

76-2096. Johnson, J. H.; Sturino, E. E.; Bourne, S. (U.S. Environ. Protection Agency, Cent. Regional Lab., Chicago, IL 60609). **An automated gas chromatographic system for pesticide residue analysis.** *J. Environ. Sci. Health* A11(2): 165-178; 1976. (22 references)

Gas chromatograms of pesticides and phthalate esters obtained using an automatic injection system were analyzed by a computerized gas chromatographic data system. The system described provides for simultaneous injection onto two independent columns equipped with individual detectors. The gas chromatographic output is processed by the computer into a report for each column, listing the names and concentrations for compounds of interest. The system has sufficient sensitivity and reliability to allow the routine detection of chlorinated pesticides at the picogram level and the organophosphorus pesticides and phthalates at the nanogram level. This system is readily incorporated into methods currently recommended by EPA pesticide residue analysis, and, once the system is calibrated, 42 injections can be made without operator intervention.

76-2097. Lubkowitz, J. A.; Galobardes, J. (Inst. Venozolano Invest. Cient., Cent. Petrol. Quim., Caracas, Venezuela). **The evaluation of a radio gas-chromatographic system for the detection of trace amounts of labelled insecticides.** *J. Environ. Sci. Health* B11(1): 49-65; 1976. (20 references)

The capability of a radio-chromatographic system to detect trace labeled insecticides was explored. The feasibility of obtaining complementary information as to insecticide breakdown was evaluated. Two insecticides, ^{14}C-ethyl (parathion) and ^{14}C-methamidophos, were used as model compounds for this study. The radio gas-chromatographic system consisted of a gas chromatograph, combustion furnace, proportional counter, and guard scintillation counter. The proportional detector is a concentration sensitive detector requiring strict flow control. Sensitivity depends on the concentration of the quenching gas used. Using these model compounds, a linear range of 3500-5000 was measured. A sensitivity of 0.98 cpm/pCi and a detection limit of 24 pCi were realized. This would allow the detection of 0.33 ng if the specific activity of the insecticide was 21.5 mCi/mMol. It is necessary to decontaminate the system in order to achieve optimum detection levels. This is accomplished by passage of oxygen through the combustion tube and by periodically injecting the corresponding non-labeled compound into the column. A solvent effect interfered in the analysis due to the sudden production and expansion of carbon dioxide. Careful choice of column conditions to prevent elution near the solvent solved this problems. A test of the system was performed using a mixture of 37 ppb of parathion and 23 ppb of its oxygen analog in orange juice.

76-2098. Lakshminarayana, V.; Menon, P. K. (Cent. Plant Protect. Training Inst., Rajendra Nagar, Hyderabad, India). **Rapid screening method for organochlorine insecticide residues on vegetables.** *J. Food Sci. Technol. (Mysore)* 12(5): 261; 1975. (4 references)

A rapid thin-layer chromatographic (TLC) method was developed for the determination of organochlorine insecticide residues in vegetables. The vegetable is extracted with acetone-hexane (1:3, v/v) for 1 hr and filtered through a cotton plug. The extract is spotted on a silica gel plate with built-in silver nitrate, along with spots of standard insecticides. The spotted plate is developed in cyclohexane at a height of 10 cm, air dried, and exposed to UV light (250 nm) for 10 min. The insecticides appear as brown-black spots on a light white background. Steaming the plate and re-exposing it to radiation increases the sensitivity of the method. Aldrin, dieldrin, endrin, lindane, DDT, and BHC, added at 1-2 ppm to vegetables, were recovered at a rate of 90-95%. Co-extractives did not interfere with the procedure. Highly colored substances and those containing lipids require a preliminary clean-up step.

76-2099. Kadnikov, V. V. (Scientific Research Institute of Agriculture of the Far North, USSR). **Khromatograficheskoe opredelenie famofosa v tkanyakh i organakh zhivotnikh. {Chromatographic determination of famophos in animal organs and tissues.}** *Khim. Sel'sk. Khoz.* 1: 18; 1976. (7 references) (Russian)

A thin-layer chromatographic method is described for the detection and quantitative determination of famophos (famphur, *O,O*-dimethyl-*O*- (4-dimethylsulfamylphenyl)- thiophosphate) and its metabolites in animal tissues and organs. Following extraction with chloroform, the sample is purified with cooled acetone, after which it is applied to an alumina-gypsum layer using a 2:1 ratio of hexane and acetone as a solvent system. The chromatogram is developed by spraying with an aqueous-acetone solution of bromphenol blue with silver nitrate or with an 0.1% aqueous solution of palladium chloride. The *Rf* of famophos is 0.06. The sensitivity of the method amounts to 0.2 mg/kg with bromphenol blue, to 0.1 mg/kg with palladium chloride, and to 0.05 mg/kg in the case of analysis of blood samples. The recovery rate is about 80%.

76-2100. Scura, E. D.; McClure, V. E. (Scripps Inst. Oceanogr., Univ. California- San Diego, La Jolla, CA). **Chlorinated hydrocarbons in seawater: analytical method and levels in the northeastern Pacific.** *Mar. Chem.* 3(4): 337-346; 1975. (9 references)

A method is described for analyzing nanogram quantities of chlorinated hydrocarbons from 1-liter samples of seawater. Seawater samples are pumped through a copper column containing a mixture, by weight, of 5% activated carbon powder, 10% MgO, and 85% refined diatomaceous earth. The chlorinated hydrocarbons in the water are adsorbed or trapped on the column and subsequently eluted with 30% benzene in acetone (v/v) for gas-liquid chromatographic analysis. Ten 1-liter replicate samples of seawater containing ^{14}C-DDT were analyzed to evaluate the procedure. Fifteen ml of 30% benzene was required for 100% recovery of the DDT. Recovery of PCB from the adsorbent bed was tested by wetting the column with 10 ml seawater, spiking the column with 20 l of isooctane containing 1.10^{-8} g Aroclor 1254, followed by 10 ml of seawater prior to elution with 30% benzene in acetone; recovery was always complete. The procedure was used to analyze chlorinated hydrocarbon levels in samples of seawater collected off the southern California coast. Anthropogenic chlorinated hydrocarbons can be used for the investigated of large-scale ocean currents and mixing processes.

76-2101. Martens, F.K.; Heyndrickx, A. (Dep. Toxicol., State Univ. Ghent, Belgium). **Toxicological analysis on human biological material after dimethoate poisoning.** *Meded. Fac. Landbouwwet. Rijksuniv. Gent* 39(2 Part): 1279-1300; 1974. (25 references)

An extraction and clean-up technique is discussed which allows differentiation of water soluble, petroleum ether-insoluble organophosphorus pesticides from petroleum ether soluble organophosphorus pesticides which are often encountered in suicidal and industrial (occupational) poisoning. Moreover, if the victim has taken some hyponotics, simultaneous detection is possible by this method. The favorable solubility in both water and diethyl ether permits the dimethoate to be extracted without breaking down the molecular structure. Interphase extraction and column chromatography with neutral alumina deactivated by 0.5% methanol in benzene, yields recoveries of 85%. Optimal results are obtained by selective clean-up and total recovery calls for careful attention to the extraction of intestinal contents and liver tissues. As long as the application of the inhibition detection technique of thin-layer chromatography is required as a supplementary identification criterion, column chromatography is undoubtedly necessary.

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